

1977

**SUSITNA
HYDROELECTRIC PROJECT**

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT No. 7114

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**ALASKA POWER AUTHORITY
COMMENTS
ON THE
FEDERAL ENERGY REGULATORY COMMISSION
DRAFT ENVIRONMENTAL IMPACT STATEMENT
OF MAY 1984**

**VOLUME 6
APPENDIX IV-
TEMPERATURE SIMULATIONS,
WATANA AND DEVIL CANYON
RESERVOIRS**

**AUGUST 1984
DOCUMENT No. 1777**

ALASKA POWER AUTHORITY

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FEDERAL ENERGY REGULATORY COMMISSION
SUSITNA HYDROELECTRIC PROJECT
PROJECT NO. 7114

ALASKA POWER AUTHORITY
COMMENTS
ON THE
FEDERAL ENERGY REGULATORY COMMISSION
DRAFT ENVIRONMENTAL IMPACT STATEMENT
OF MAY 1984

Volume 6

Appendix IV - Temperature Simulations, Watana
and Devil Canyon Reservoirs

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August 1984

APPENDIX IV

This Appendix contains results of Watana and Devil Canyon reservoir temperature simulations using the Dynamic Reservoir Simulation Model (Harza-Ebasco 1984). Reservoir outflow temperatures, ice thicknesses, and temperature profiles are included. Simulations were made in response to the Federal Energy Regulatory Commission's (FERC) Request for Supplemental Information of April, 1983 (copy of response attached as Exhibit A) and are referenced in the Alaska Power Authority's Technical Comments on the FERC's Draft Environmental Impact Statement (DEIS) numbers AQR003, AQR032, AQR033, AQR038, AQR043, AQR046, AQR066, AQR071, AQR098, AQR099 and AQR109. Simulations were made for various hydrological and meteorological conditions, for four levels of project energy demands and for the three years required to fill Watana Reservoir. Case C minimum target flows, as defined in the License Application (p. E-2-57) were used. Low level, mid-level and multi-level intakes and the spillway were operated in accordance with policies set out in the License Application, Exhibit E, Chapter 2. The policy for operating the multi-level intake to the powerhouse was to discharge water having temperatures as close to natural river temperatures as possible. (License Application p. E-2-119).

The reservoir temperature simulations in this Appendix provided the upstream boundary conditions for river temperature and river ice simulations.

Temperature simulations for Devil Canyon Reservoir in this Appendix are significantly different than the temperature simulations for Devil Canyon presented in the License Application. A review of the License Application Dynamic Reservoir Simulation Model (DYRESM) input indicated that the reservoir volume employed in the License Application simulations was too high by a factor of 6. This caused simulated outflow temperatures from Devil Canyon to be lower in the summer and higher in the winter by 1°C to 2°C than for simulations for similar energy demands and weather using the correct reservoir volume. The river temperature simulations presented in

the License Application for Devil Canyon operation would reflect this error in the area near the dam. Further downstream, the effects of this error would be smaller.

The reservoir temperature simulations in this Appendix were made with the correct elevation-area-volume relationship. The resulting outflow temperatures from Devil Canyon reservoir are much more similar to outflow temperatures from Watana Reservoir. Devil Canyon Reservoir tends to smooth out some of the peaks and valleys in Watana reservoir outflow temperatures.

The meteorologic and hydrologic data utilized for simulating Watana and Devil Canyon Reservoir temperatures are summarized on plots. Meteorologic data collected by R & M Consultants, Inc. (R & M) at weather stations at Devil Canyon and Watana (R&M 1982a, 1982b, 1982c, 1982d, 1984a, 1984b) were utilized for reservoir simulations for the period 1980-1983. Data collected at the National Oceanic and Atmospheric Administration (NOAA) weather stations at Summit were used for simulations for the period 1970-1977. These data were supplemented by data collected by NOAA at Talkeetna and Anchorage and by R & M at other locations in the Susitna Basin.

As indicated in Exhibit A, the years 1974-1975, 1982-1983 and 1981-1982 were selected to represent dry, average and wet hydrologic conditions, respectively, as requested by FERC. Simulations were made for 1971-1972 and 1976-1977 to provide cold and average winter outflow conditions for use in simulation of river ice.

Each temperature simulation in this Appendix was initiated in November, six months preceding the period of interest for assessment of impacts. This was done because the Watana reservoir is generally isothermal in November. For analyses of biological effects, temperatures should not be used for the initial six month periods between November and May. The exceptions to this rule are the first year of filling simulations. These simulations were carried out to verify that the reservoir would become isothermal by November of the first winter of filling, so that simulations of the second and third

years of filling could begin with isothermal conditions in November of the first winter. Additionally, simulations for the period November 1980 to May 1983 were run continuously and only the period November 1980 to April 1981 should not be used.

The temperature simulation for the third summer of filling assumed all flow would be through the mid-level outlet works. The License Application (Fig C.1), however, indicates that units 1 and 2 would be operational on April 1 and July 1, 1993, respectively. Thus, some flow would be passed through the multi-level intake during the third summer of filling. This would tend to cause temperatures to be slightly warmer than indicated in this Appendix for the third summer of filling.

REFERENCES

1. Harza-Ebasco Susitna Joint Venture, 1984, "Eklutna Lake Temperature and Ice Study - with Six Months Simulation for Watana Reservoir", Susitna Hydroelectric Project Report.
2. R&M Consultants, Inc., 1982a, "Processed Climatic Data, Vol. 5, 0650 Watana Station October 1981 - September 1982", Susitna Hydroelectric Project Report.
3. R&M Consultants, Inc., 1982b, "Processed Climatic Data, Vol. 6, 0660, Devil Canyon Station October 1981 - September 1982", Susitna Hydroelectric Project Report.
4. R&M consultants, Inc., 1982c, "Processed Climatic Data, Vol. 5, Watana Station, April 1980 - September 1981", Susitna Hydroelectric Project Report.
5. R&M Consultants, Inc., 1982d, "Processed Climatic Data, Vol. 6, Devil Canyon Station, July 1980 - September 1981", Susitna Hydroelectric Project Report.
6. R&M Consultants, Inc., 1984a, "Processed Climatic Data, Vol. 5, Devil Canyon Station, October 1982 - September 1983", Susitna Hydroelectric Project Report.
7. R&M Consultants, Inc., 1984b, "Processed Climatic Data., Vol 4, Watana Station, October 1982 - September 1983", Susitna Hydroelectric Project Report.

LIST OF EXHIBITS

<u>Exhibit</u>	<u>Title</u>
A	The Alaska Power Authority's Response to the Federal Energy Regulatory Commission's Request for Supplemental Information of April 12, 1983 - Schedule B, Exhibit E. No. 2.28.
B	Watana Reservoir Weather Data, November 1980 - April 1983.
C	Devil Canyon Reservoir Weather Data, November 1980 - April 1983.
D	Watana and Devil Canyon Reservoir Weather Data, November 1970 - April 1972, November 1973 - April 1975, November 1975 - April 1977.
E	Watana Reservoir Inflow and Outflow - November 1970 - April 1972.
F	Devil Canyon Reservoir Inflow and Outflow - November 1970 - April 1972.
G	Watana Reservoir Inflow and Outflow - November 1973 - April 1975.
H	Devil Canyon Reservoir Inflow and Outflow - November 1973 - April 1975.
I	Watana Reservoir Inflow and Outflow - November 1975 - April 1977
J	Devil Canyon Reservoir Inflow and Outflow, November 1975 - April 1977
K	Watana Reservoir Inflow and Outflow - November 1980 - April 1983
L	Devil Canyon Reservoir Inflow and Outflow, November 1980-April 1983.

LIST OF EXHIBITS

<u>Exhibit</u>	<u>Reservoir(s) Operating</u>	<u>Reservoir Temperature Simulation</u>	<u>Energy Demand Year</u>	<u>Meteorologic and Hydrologic Data Period¹</u>
M	Watana	Watana	First year of filling ²	5/81 - 4/82
N	Watana	Watana	First year of filling ²	5/82 - 4/83
O	Watana	Watana	Second year of filling ²	5/81 - 4/82
P	Watana	Watana	Third year of filling ²	5/82 - 4/83
Q	Watana	Watana	1996	5/71 - 4/72
R	Watana	Watana	1996	5/74 - 4/75
S	Watana	Watana	1996	5/76 - 4/77
T	Watana	Watana	1996	5/81 - 4/82
U	Watana	Watana	1996	5/82 - 4/83
V	Watana	Watana	2001	5/71 - 4/72
W	Watana	Watana	2001	5/74 - 4/75
X	Watana	Watana	2001	5/81 - 4/82
Y	Watana	Watana	2001	5/82 - 4/83
Z	Watana and Devil Canyon	Watana	2002	5/71 - 4/72
AA	Watana and Devil Canyon	Watana	2002	5/74 - 4/75
AA	Watana and Devil Canyon	Watana	2002	5/76 - 4/77
AC	Watana and Devil Canyon	Watana	2002	5/81 - 4/82
AD	Watana and Devil Canyon	Watana	2002	5/82 - 4/83
AE	Watana and Devil Canyon	Watana	2020	5/71 - 4/72
AF	Watana and Devil Canyon	Watana	2020	5/74 - 4/75

LIST OF EXHIBITS

<u>Exhibit</u>	<u>Reservoir(s) Operating</u>	<u>Reservoir Temperature Simulation</u>	<u>Energy Demand Year</u>	<u>Meteorologic and Hydrologic Data Period¹</u>
AG	Watana and Devil Canyon	Watana	2020	5/76 - 4/77
AH	Watana and Devil Canyon	Watana	2020	5/81 - 4/82
AI	Watana and Devil Canyon	Watana	2020	5/82 - 4/83
AJ	Watana and Devil Canyon	Devil Canyon	2002	5/71 - 4/72
AK	Watana and Devil Canyon	Devil Canyon	2002	5/74 - 4/75
AL	Watana and Devil Canyon	Devil Canyon	2002	5/76 - 4/77
AM	Watana and Devil Canyon	Devil Canyon	2002	5/81 - 4/82
AN	Watana and Devil Canyon	Devil Canyon	2002	5/82 - 4/83
AO	Watana and Devil Canyon	Devil Canyon	2020	5/71 - 4/72
AP	Watana and Devil Canyon	Devil Canyon	2020	5/74 - 4/75
AQ	Watana and Devil Canyon	Devil Canyon	2020	5/76 - 4/77
AR	Watana and Devil Canyon	Devil Canyon	2020	5/81 - 4/82
AS	Watana and Devil Canyon	Devil Canyon	2020	5/82 - 4/83

FOOTNOTES

¹Temperature simulations shown in the Appendix normally begin in November, six months prior to the period shown in this table. This was done because the reservoir(s) would generally be isothermal in November. Simulations made for the period November 1980 through April 1983 were run continuously.

²Two simulations were made for the first year of filling for purposes of river ice modeling and to demonstrate that the reservoir becomes isothermal in November of the first year of filling. Since data were not available for the study area for a continuous three year period the simulations for the second and third years of filling utilized data for the period November 1980 to May 1983. Having verified that the reservoir would become isothermal during November of the first winter of filling, the simulation of the second and third years of filling was begun with data from November of 1980 with an isothermal reservoir at the water temperature and level simulated for November of the first winter of filling. The simulation carried through until the completion of filling in the third winter.

EXHIBIT A

Exhibit A

**The Alaska Power Authority's Response to the Federal Energy Regulatory
Commission's Request for Supplemental Information of April 12, 1983 -
Schedule B, Exhibit E No. 2.28.**

EXHIBIT E

2. Water Use and Quality

Comment 28 (p. E-2-87, para. 1)

Provide longitudinal profiles of predicted weekly average temperatures downstream of Watana Dam and Devil Canyon/Watana using the DYRSEM and HEATSIM models. Simulations for stations with pre-project temperature data should be provided with Watana in operation and Devil Canyon/Watana in operation using data for an average water year and for conditions of minimum releases (i.e., using data for a minimum flow year) from Watana and from Devil Canyon. Listings of inputs used and assumptions made in each simulation should also be provided. Outflow temperature from each reservoir used in the HEATSIM model should include the temperatures that would have to be available at the multilevel intakes in order to match pre-dam temperatures that would have to be available at the multilevel intakes in order to match pre-dam temperatures. Meteorological conditions used as model parameters should be provided. These simulated average weekly temperatures should be compared to pre-project temperatures measured during low-flow and average flow years. Provide parameter values used in each simulation and document the source of the values used.

Response:

Daily simulations of reservoir and river temperatures had been prepared to provide the longitudinal profiles of temperatures downstream of Watana dam and Watana/Devil Canyon using the DYRESM and HEATSIM models for a wet year (1981) condition (Acres American Inc., 1983a, 1983b). Selected profiles from the daily simulations are given as Figures 8.44 to 8.56 (attached) in Acres 1983b. Figures 8.44 through 8.56 (see pages 2-28-6 to 2-28-18) correspond to Figures E.2.176 through E.2.178, E.2.180 through E.2.183, and E.2.217 through E.2.222 of Exhibit E, Chapter 2 of the license document.

To provide average weekly temperatures, for comparisons with pre-project temperatures during low-flow and average flow years, additional studies will be conducted in 1983. A work plan to carry out the studies and to provide the updated parameter values and their sources is presented as follows:

1. The parameter values of DYRESM used (in Acres 1983a) will be updated through additional calibration using Eklutna Lake data, including data collected after January 1, 1983. This calibration effort will be completed by January 1, 1984.
2. Water temperature profiles downstream from Watana will be determined by SNTMP model^{1/} (Stream Network Temperature Model). The calibration of SNTMP will be made using existing streamflow, stream temperature, and meteorological data.
3. The reservoir temperature profiles will be determined using the DYRESM model and the updated parameter values. Outflow temperatures from the reservoir temperature model will be used as inputs for the SNTMP model to provide longitudinal profiles of temperatures downstream from the reservoir. This study will be completed by June 30, 1984.

Weekly simulations will be made for comparison with pre-project temperatures measured during low-flow and average flow years for the following cases:

^{1/}AEIDC will perform river temperature studies using SNTMP model.

- (a) Filling of Watana reservoir
- (b) Watana in operation
- (c) Watana/Devil Canyon in operation

Although not specifically requested case (a), filling of Watana Reservoir is included because the cited paragraph (E-2-87, para. 1) is in the section entitled "Impoundment of Watana Reservoir".

Weekly simulations of the reservoir thermal behavior will be performed under various power operation schemes for low-flow, average-flow, and high-flow (1981) years. The resulting outflow temperatures at the multilevel intakes, will be used as inputs to the downstream temperature simulations using the SNTEMP model.

The computed temperatures will be compared with the measured pre-project temperatures. Results of the 1983 Study (Acres 1983b) for wet year conditions will also be verified.

The representative years for low-flow (dry), average-flow (average), and high-flow (wet) years conditions are selected based on the available stream-flow data. From a frequency analysis of annual flow volumes at Gold Creek, water years 1974, 1982 and 1981 may be considered as dry, average, and wet years, respectively.

At the completion of the study, a summary report will be prepared. The report will include:

- (a) A listing of inputs used in the study.

- (b) The assumptions made in each simulation.
- (c) The parameter values used in each simulation and documentation of their sources.
- (d) The outflow temperatures from each reservoir.
- (e) A comparison of simulated average weekly temperatures with measured pre-project temperatures.

Outflow temperatures will include the temperatures that would have to be available at the multilevel intakes in order to match pre-dam temperatures. The study will be completed by June 30, 1984.

The parameter values used for the 1983 reservoir thermal simulations are given in the following table:

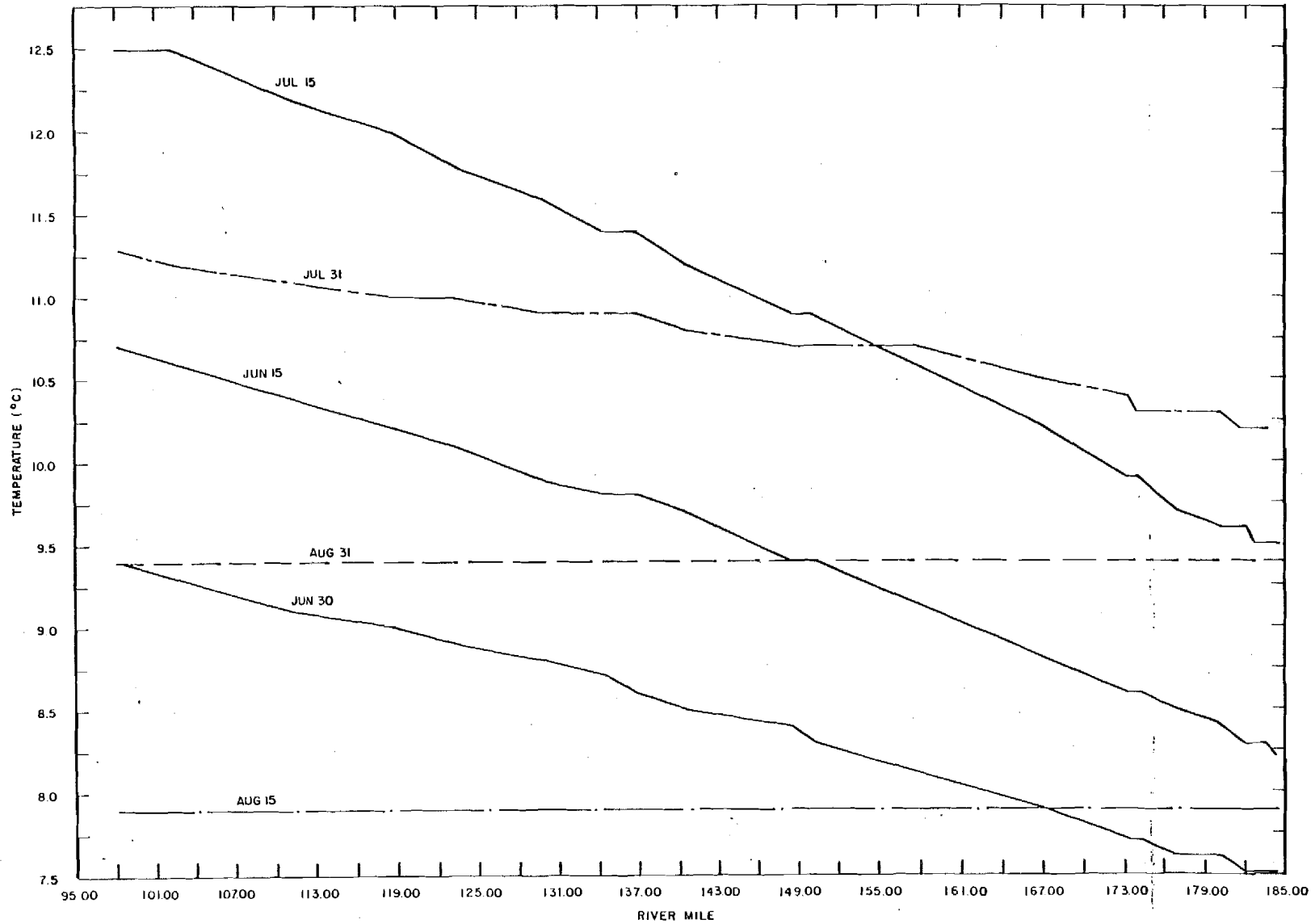
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Convective overturn, CK	0.125
Mechanical stirring, ETA	1.230
Temporal effects, CT	0.510
Shear production, CS	0.200
Diffusion constant	
W = Wedderburn number	
W > 1 (for general condition)	0.048
W ≤ 1 (for high wind condition)	0.096
Drag coefficients	0.015

These parameters values were derived from calibration of the model to Eklutna Lake (Acres 1983b).

References

Acres American Incorporated, "Susitna Hydroelectric Project, License Application, Volumes 5A, and 5B," prepared for Alaska Power Authority, 1983(a).

Acres American Incorporated, "Susitna Hydroelectric Project Feasibility Report - Supplement, Chapter 8: Reservoir and River Temperature Studies," prepared for Alaska Power Authority, 1983(b).



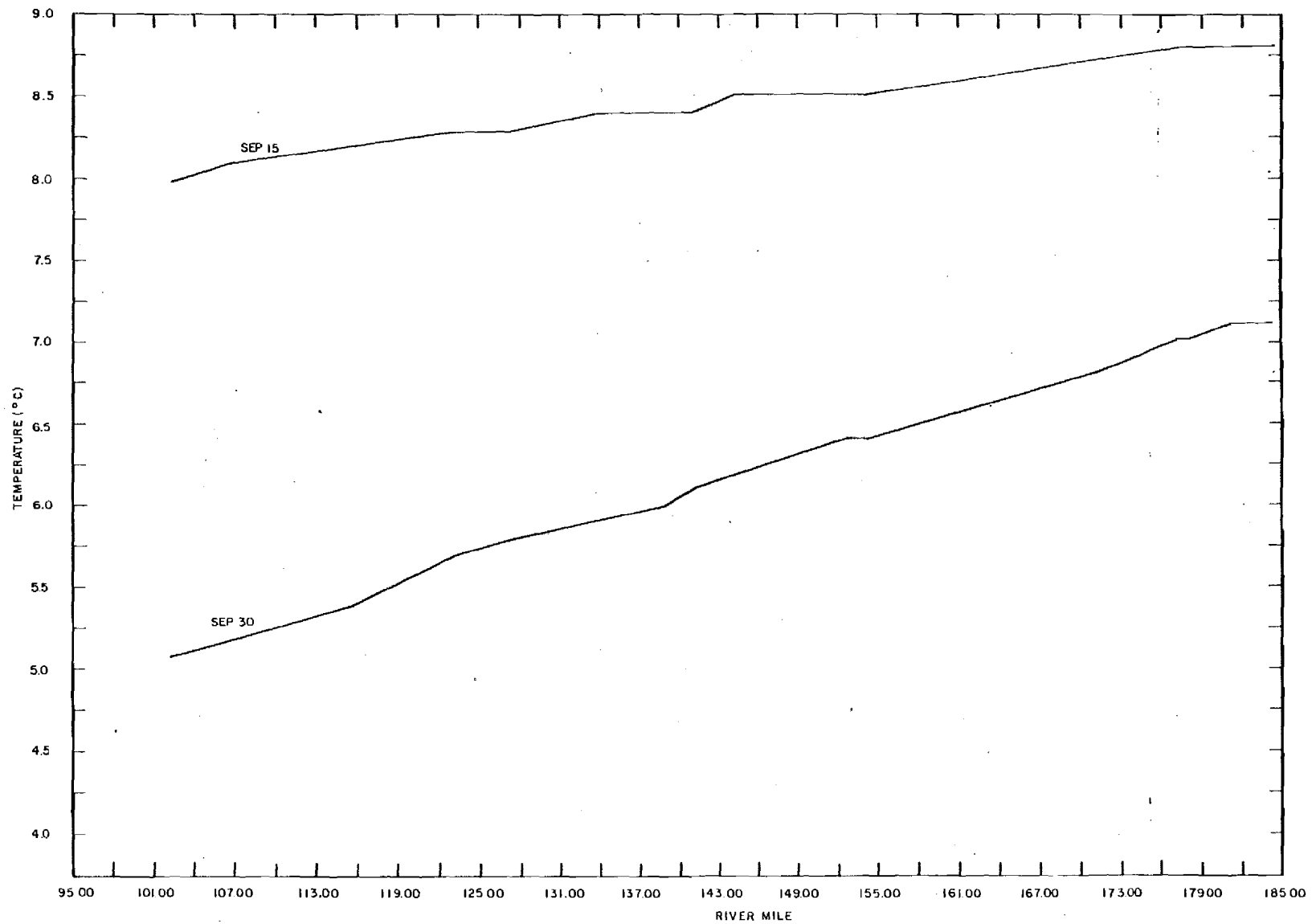
WATANA DISCHARGE (CFS):
 JUN 15 4410
 JUN 30 4210
 JUL 15 4130
 JUL 31 3970
 AUG 15 6250
 AUG 31 21000 (RELEASE)

NOTE:

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. WATANA TEMPERATURE AND DISCHARGE FROM DYRESM MODEL. (RUN WA4020)

WATANA OPERATION:
 DOWNSTREAM TEMPERATURES - JUN TO AUG

2-28-6



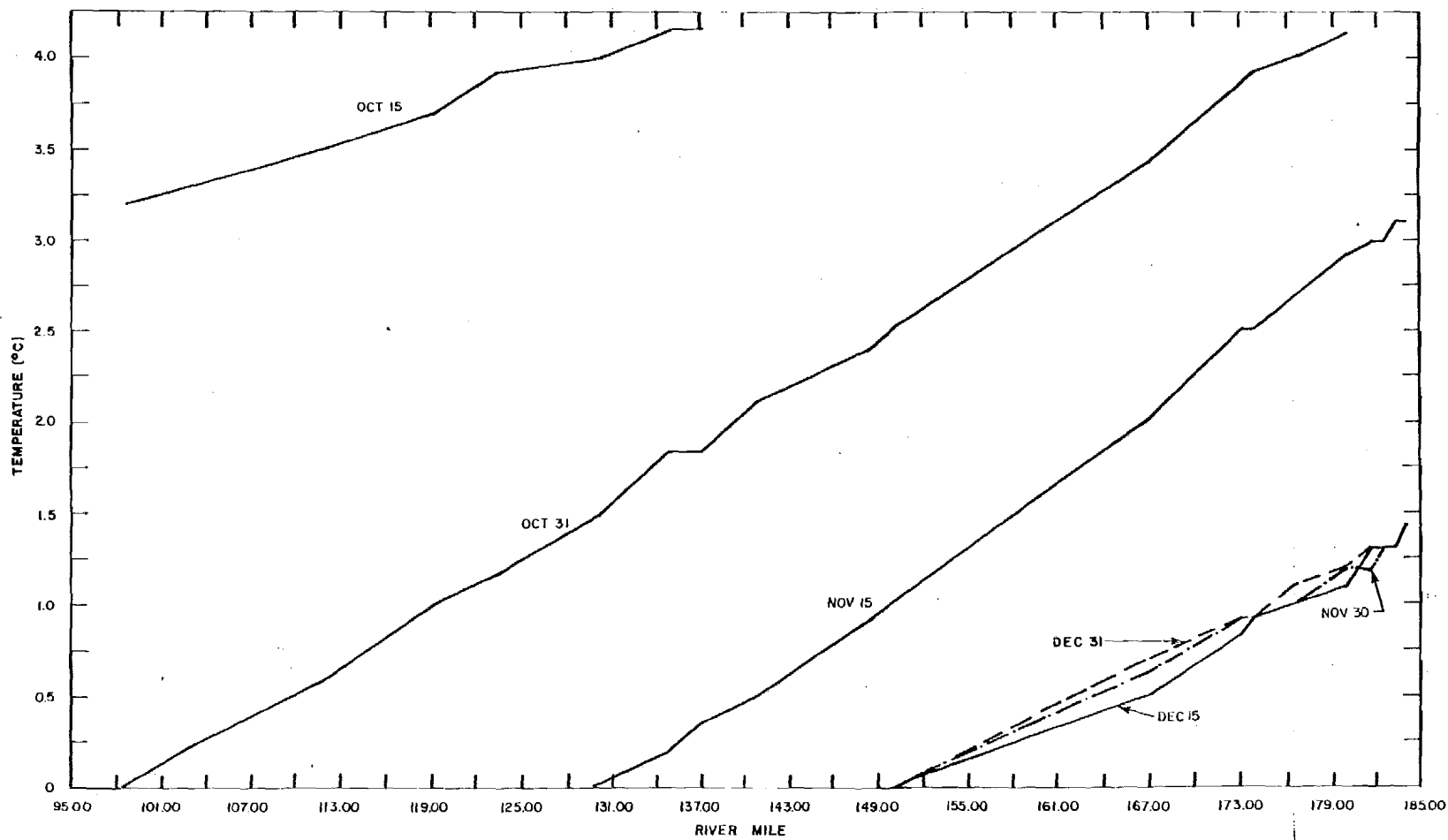
WATANA DISCHARGE (CFS):
 SEP 15 12200 (RELEASE)
 SEP 30 9460

NOTE:

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. WATANA TEMPERATURES AND DISCHARGE FROM DYRESM MODEL. (RUN WA4020)

WATANA OPERATION
 DOWNSTREAM TEMPERATURES - SEP

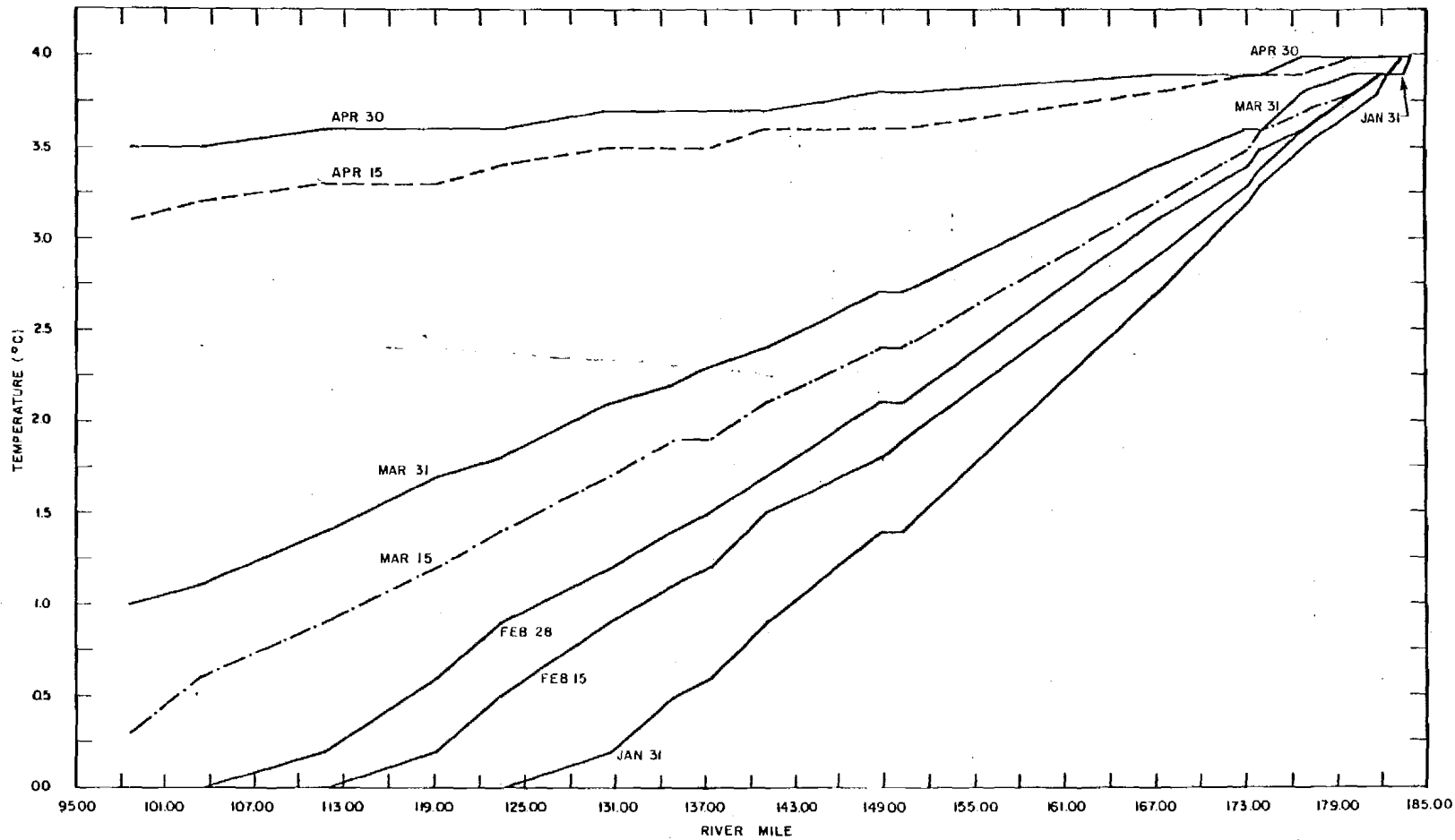
2-28-7



- NOTES:
1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
 2. WATANA TEMPERATURES AND DISCHARGE FROM DYRESM MODEL. (RUN WA4020)

WATANA OPERATION:
DOWNSTREAM TEMPERATURES -OCT TO DEC

2-28-8

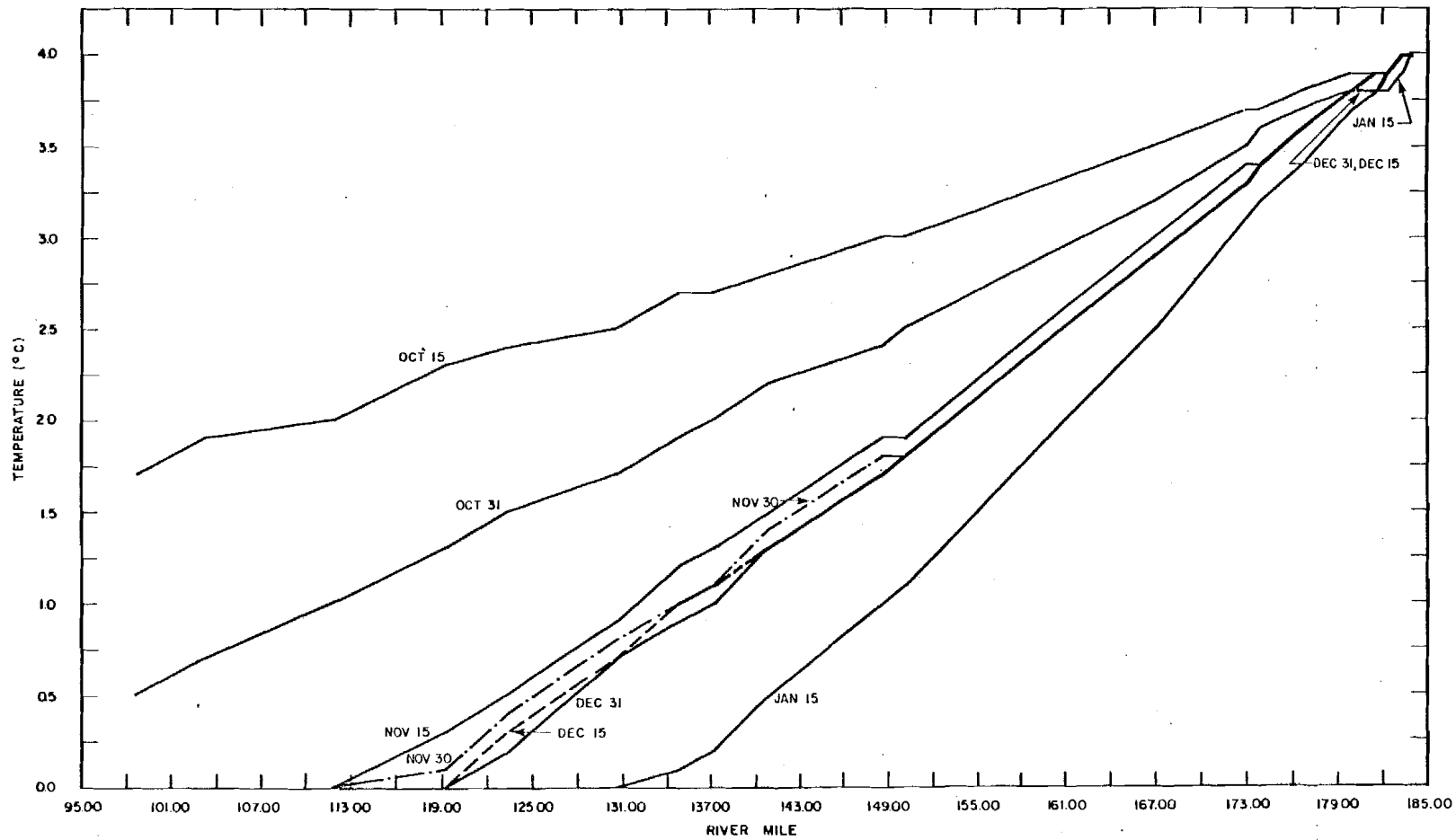


WATANA DISCHARGE (CFS):
 JAN 9400
 FEB 8690
 MAR 8100
 APR 7480

NOTE:
 MODEL ASSUMES DAILY BASED LONG TERM
 AVERAGE METEOROLOGICAL DATA AND
 MEAN MONTHLY FLOWS AT WATANA.

WATANA OPERATION:
 DOWNSTREAM TEMPERATURES - JAN TO APR
 OUTFLOW TEMPERATURE 4°C

2-28-9

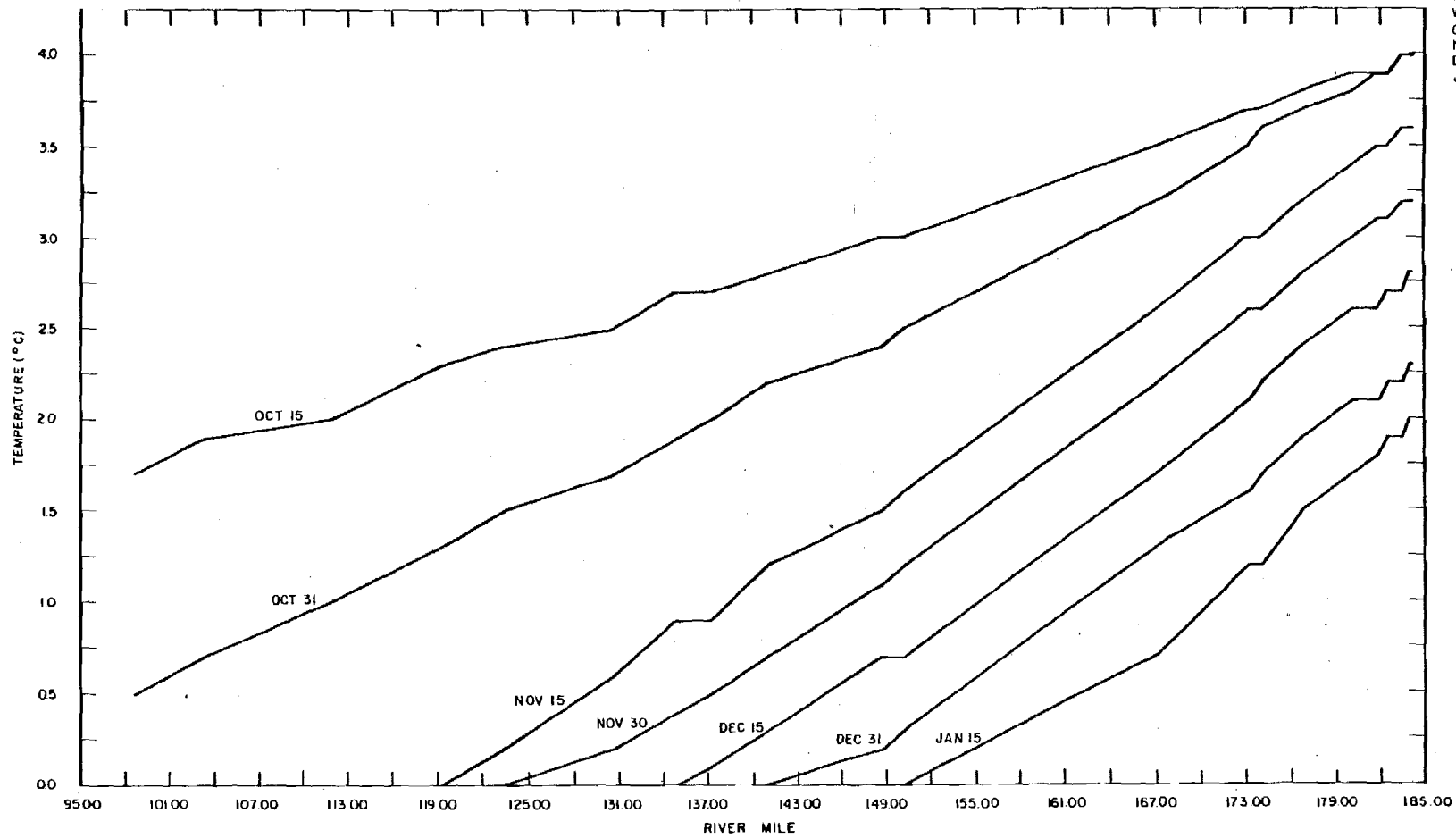


NOTE :

MODEL ASSUMES DAILY BASED LONG TERM
 AVERAGE METEOROLOGICAL DATA AND
 MEAN MONTHLY FLOWS AT WATANA

WATANA OPERATION:
 DOWNSTREAM TEMPERATURES - OCT TO JAN
 OUTFLOW TEMPERATURE 4°C

2-28-10



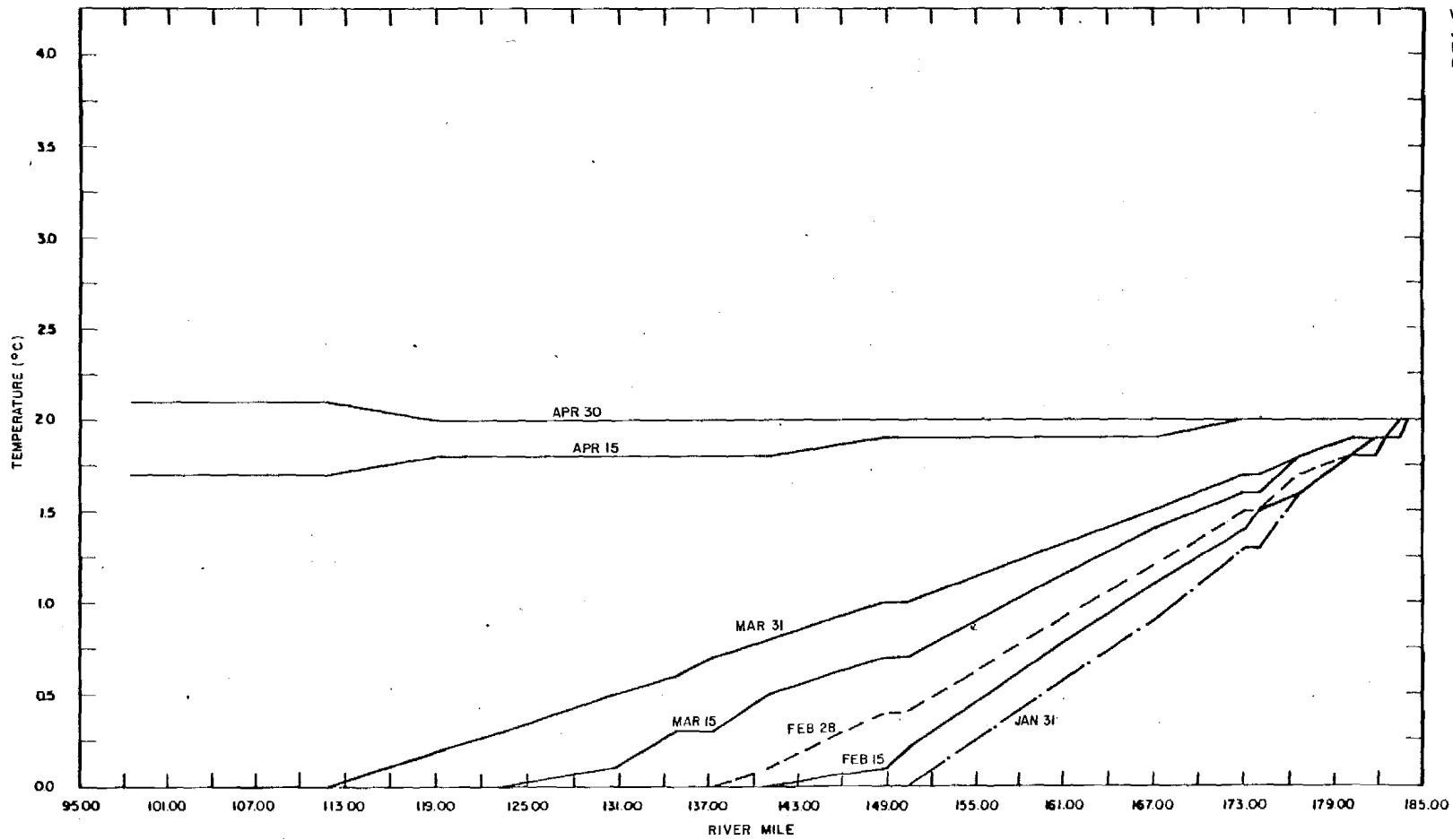
WATANA DISCHARGE (CFS):
 OCT 6770
 NOV 8670
 DEC 10301
 JAN 9400

NOTE:

MODEL ASSUMES DAILY BASED LONG TERM
 AVERAGE METEOROLOGICAL DATA AND
 MEAN MONTHLY FLOWS AT WATANA.

WATANA OPERATION: DOWNSTREAM TEMPERATURES - OCT TO JAN
 OUTFLOW TEMPERATURE 4 TO 2°C

2-28-11

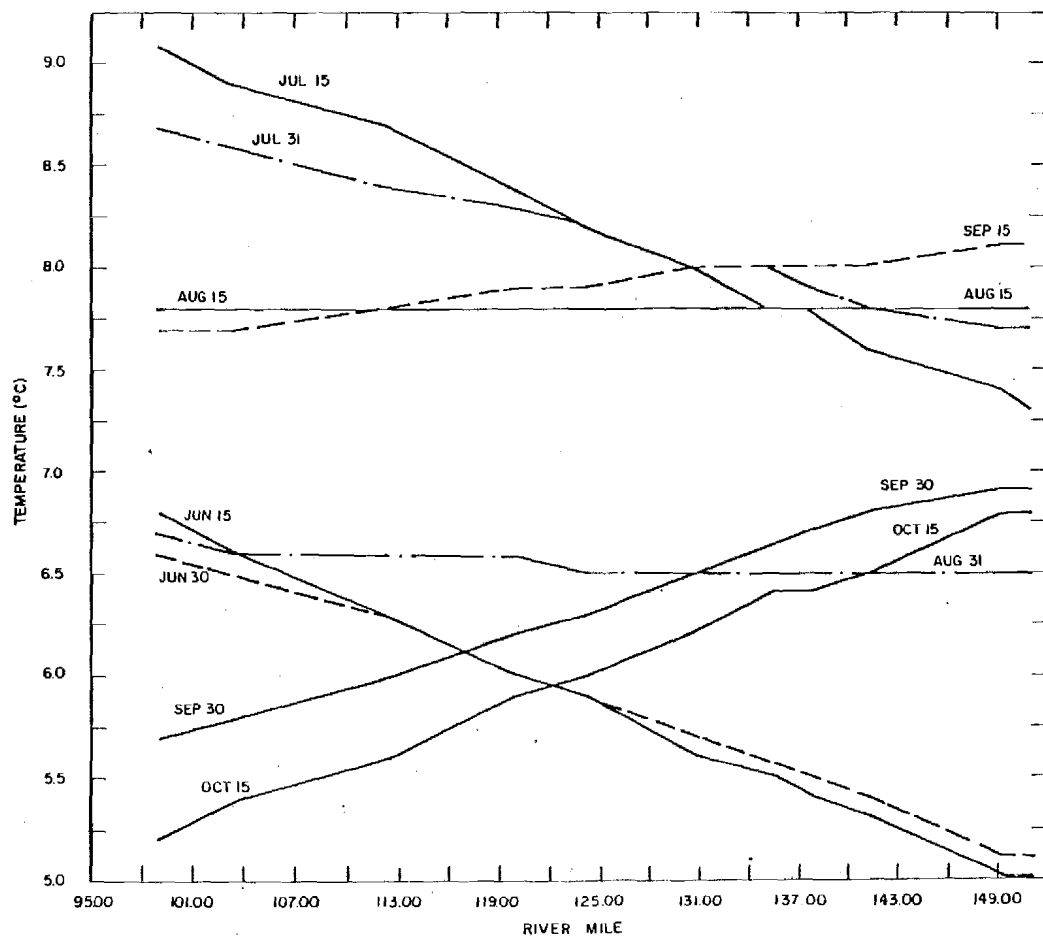


NOTE :

1. MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT WATANA.

WATANA OPERATION: DOWNSTREAM TEMPERATURES - JAN TO APR
 OUTFLOW TEMPERATURE 4 TO 2°C

2-28-12



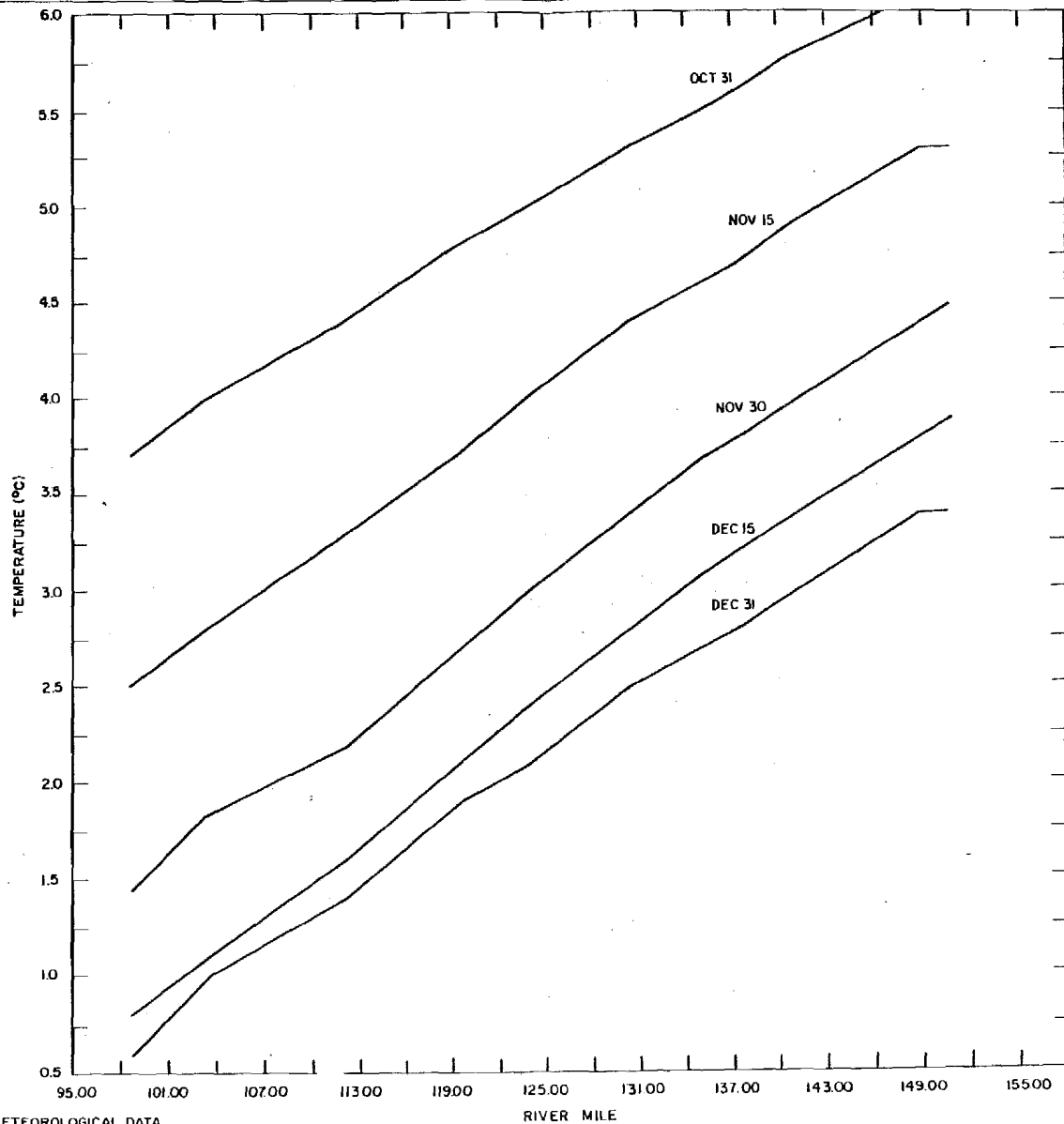
DEVIL CANYON DISCHARGE (CFS):
 JUN 15 7920
 JUN 30 5740
 JUL 15 6830
 JUL 31 6480
 AUG 15 9940
 AUG 31 24100 (RELEASE)
 SEP 15 13750
 SEP 30 10600
 OCT 15 7450

NOTE:

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. DEVIL CANYON TEMPERATURE AND DISCHARGE FROM DYRESM MODEL. (RUNS DC1020 AND DC1021)

WATANA / DEVIL CANYON OPERATION
 DOWNSTREAM TEMPERATURES - JUN TO OCT

2-28-13



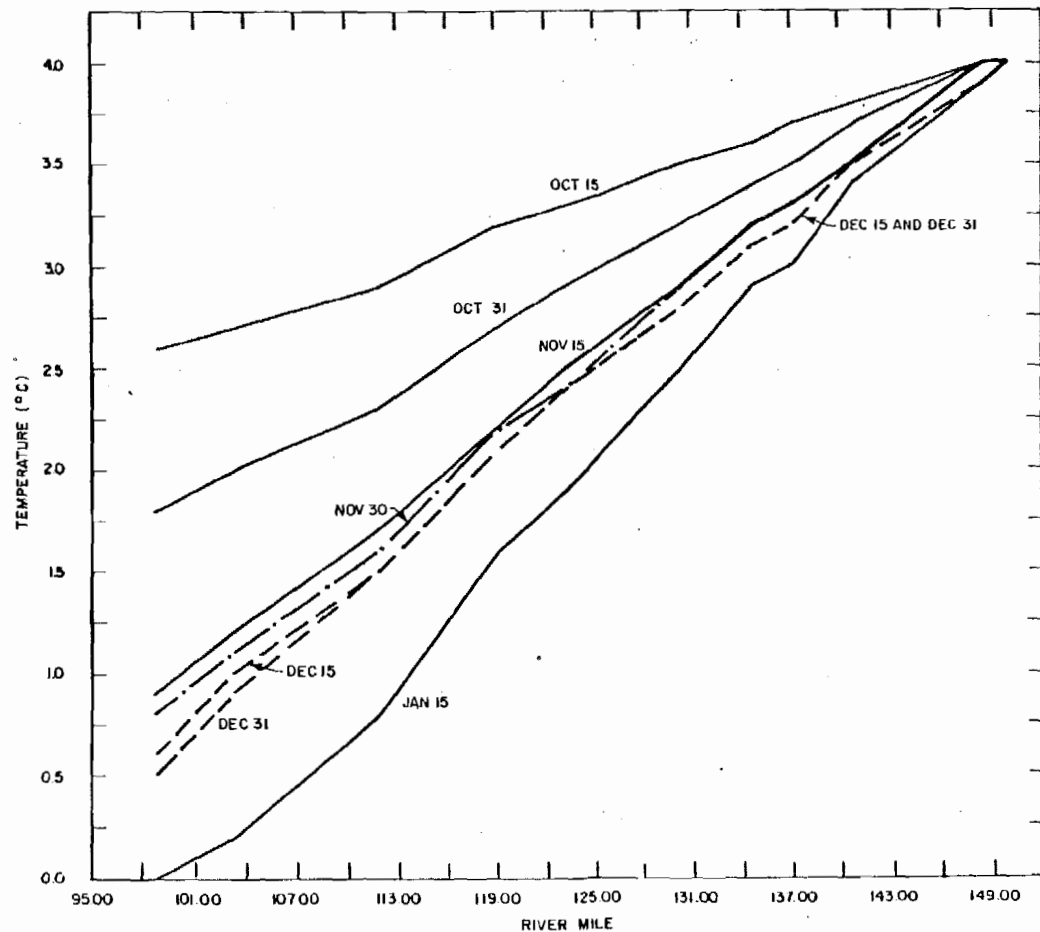
DEVIL CANYON DISCHARGE (CFS):
 OCT 31 8690
 NOV 15 10300
 NOV 30 10500
 DEC 15 10900
 DEC 31 11100

NOTE:

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. DEVIL CANYON TEMPERATURE AND DISCHARGE FROM DYRESM MODEL. (RUN DC1022)

WATANA / DEVIL CANYON OPERATION
 DOWNSTREAM TEMPERATURES - OCT TO DEC

7 28-14



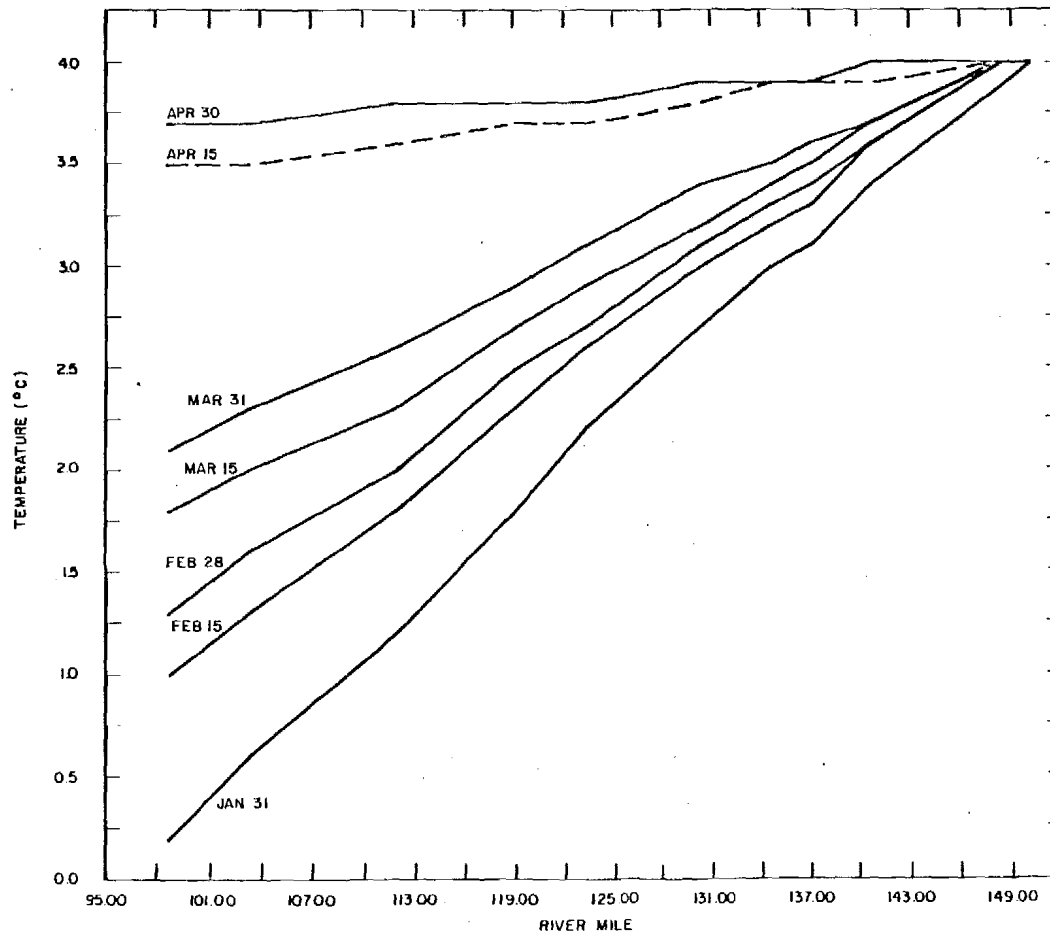
DEVIL CANYON DISCHARGE (CFS):
 OCT 7320
 NOV 9490
 DEC 11,130
 JAN 10,480

NOTE:

MODEL ASSUMES DAILY BASED LONG TERM
 AVERAGE METEOROLOGICAL DATA AND
 MEAN MONTHLY FLOWS AT DEVIL CANYON.

WATANA/DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - OCT TO JAN
 OUTFLOW TEMPERATURE 4°

2-28-15

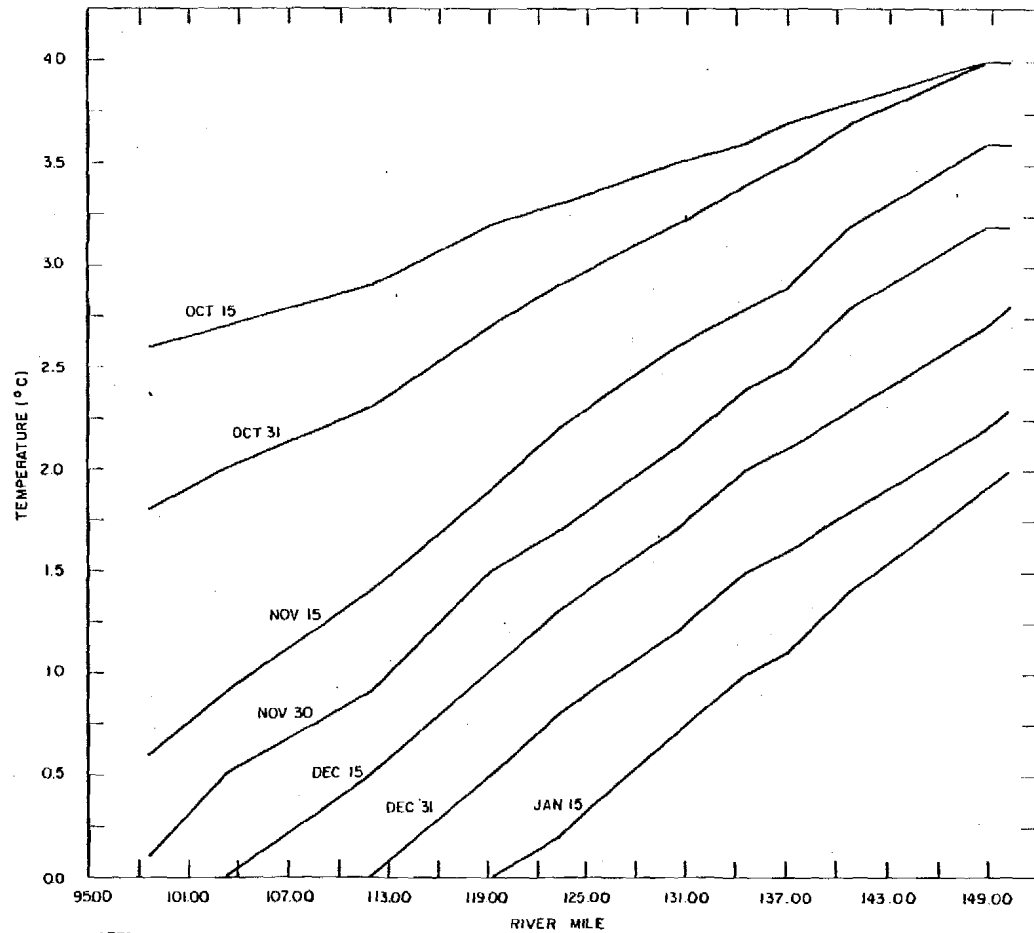


DEVIL CANYON DISCHARGE (CFS):
 JAN 10,480
 FEB 10,090
 MAR 9200
 APR 8010

NOTE:
 MODEL ASSUMES DAILY BASED LONGTERM
 AVERAGE METEOROLOGICAL DATA AND
 MEAN MONTHLY FLOWS AT DEVIL CANYON.

WATANA / DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - JAN TO APR
 OUTFLOW TEMPERATURE 4°C

2.22.1a

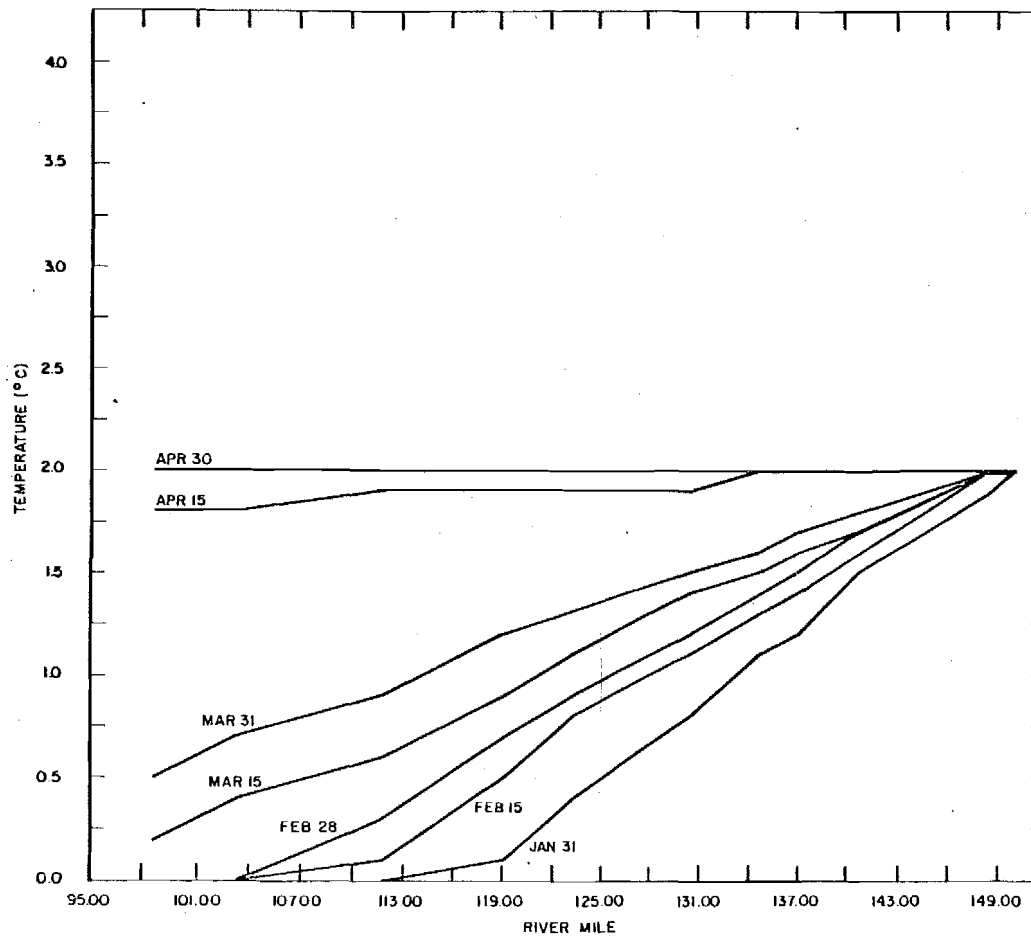


DEVIL CANYON DISCHARGE (CFS):
 OCT 7320
 NOV 9440
 DEC 11,130
 JAN 10,480

NOTE:
 MODEL ASSUMES DAILY BASED LONG TERM
 AVERAGE METEOROLOGICAL DATA AND
 MEAN MONTHLY FLOWS AT DEVIL CANYON.

WATANA/DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - OCT TO JAN
 OUTFLOW TEMPERATURES 4 TO 2°C

2-28-17



DEVIL CANYON DISCHARGE (CFS):
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 FEB 10,090
 MAR 9200
 APR 8010

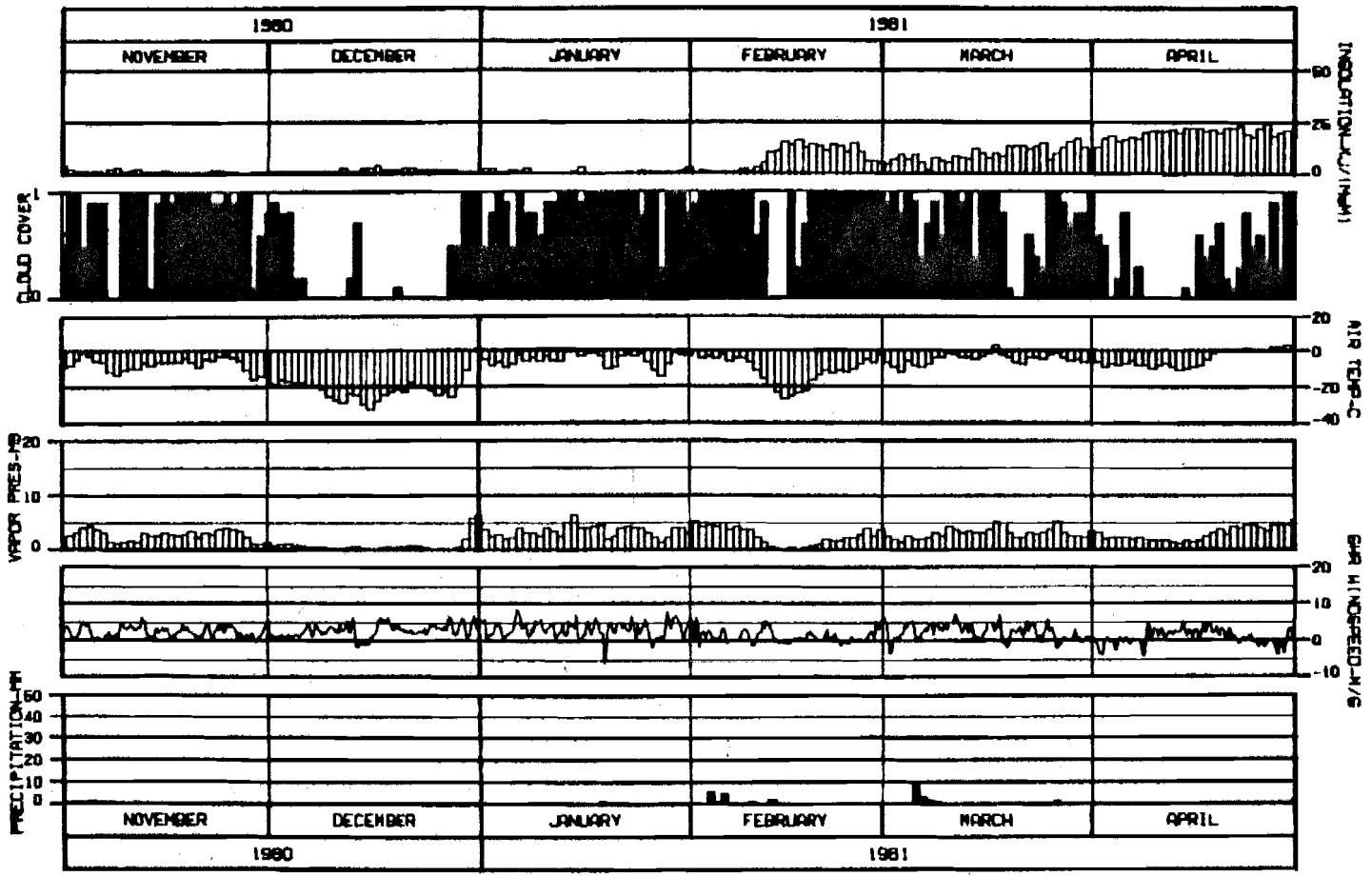
NOTE:
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WATANA/DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - JAN TO APR
 OUTFLOW TEMPERATURE 4 TO 2°C

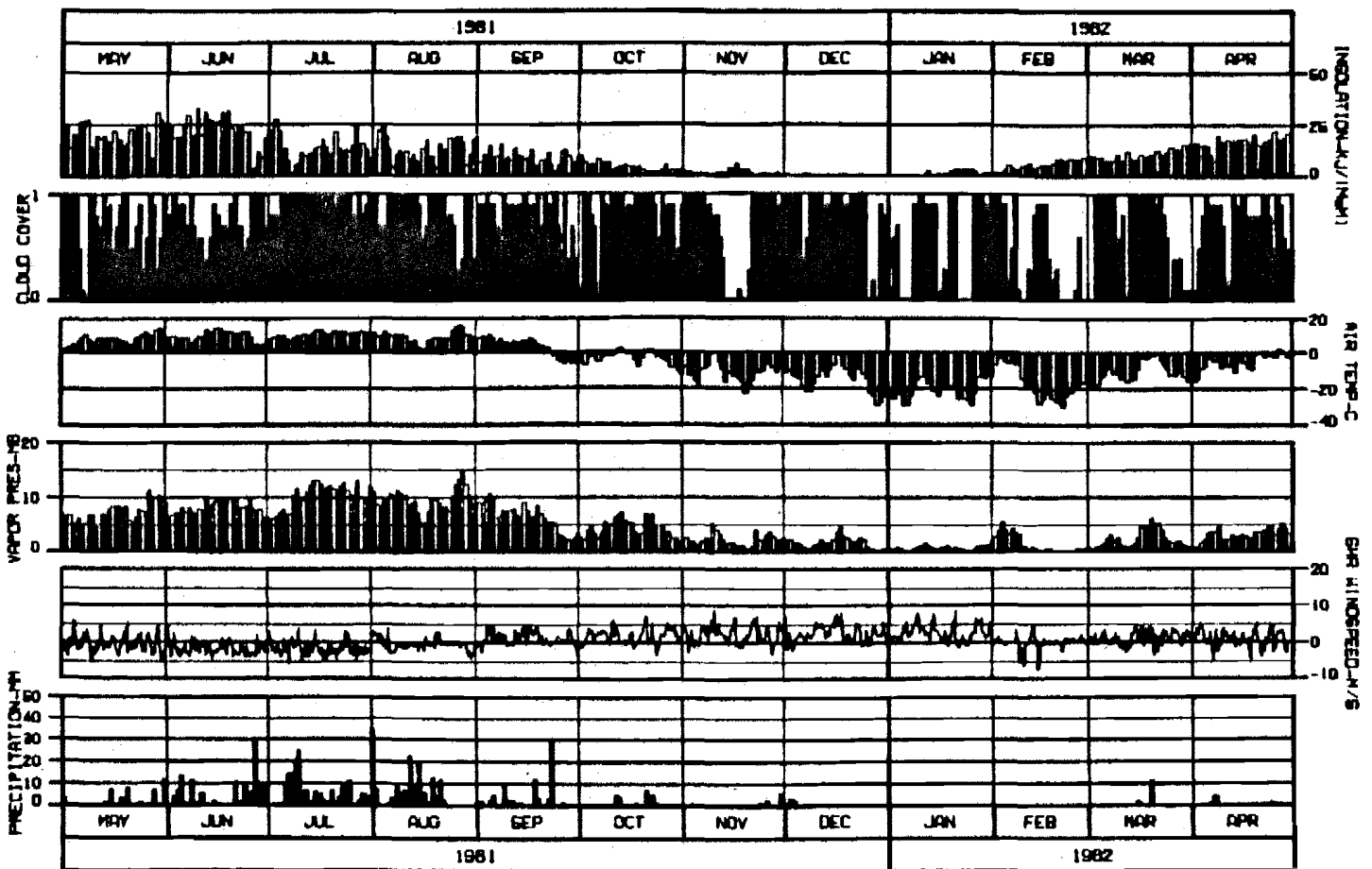
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Weather Data

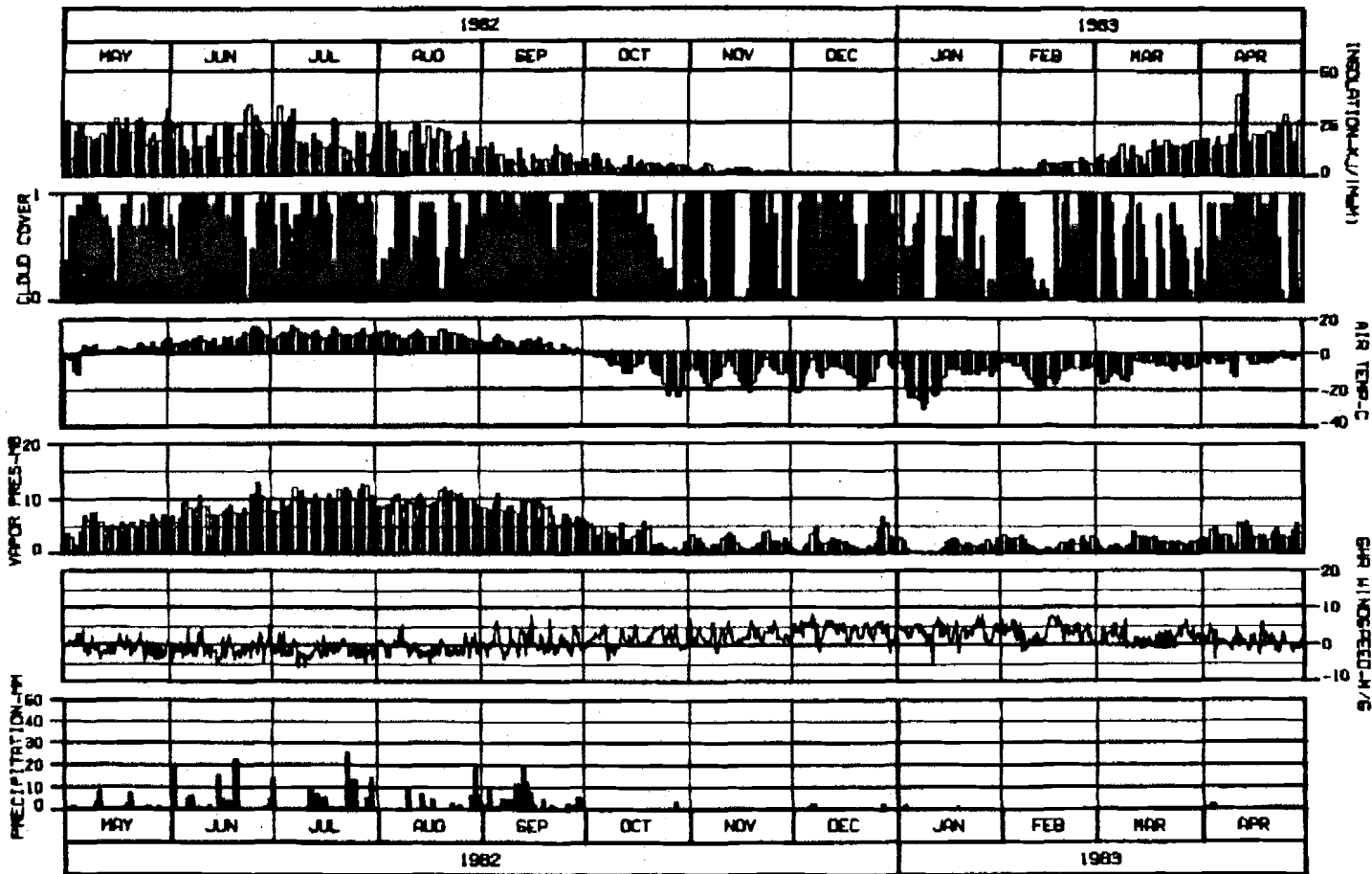
EXHIBIT B



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WATANA RESERVOIR WEATHER DATA	
HARZA-EBASCO JOINT VENTURE	
CHARGE: DLA 0-000	18 JUL 84 49-010-00



ALASKA POWER AUTHORITY	
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WATANA RESERVOIR WEATHER DATA	
MARZA-EBASCO JOINT VENTURE	
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ALASKA POWER AUTHORITY

SUBITNA PROJECT

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WATANA RESERVOIR

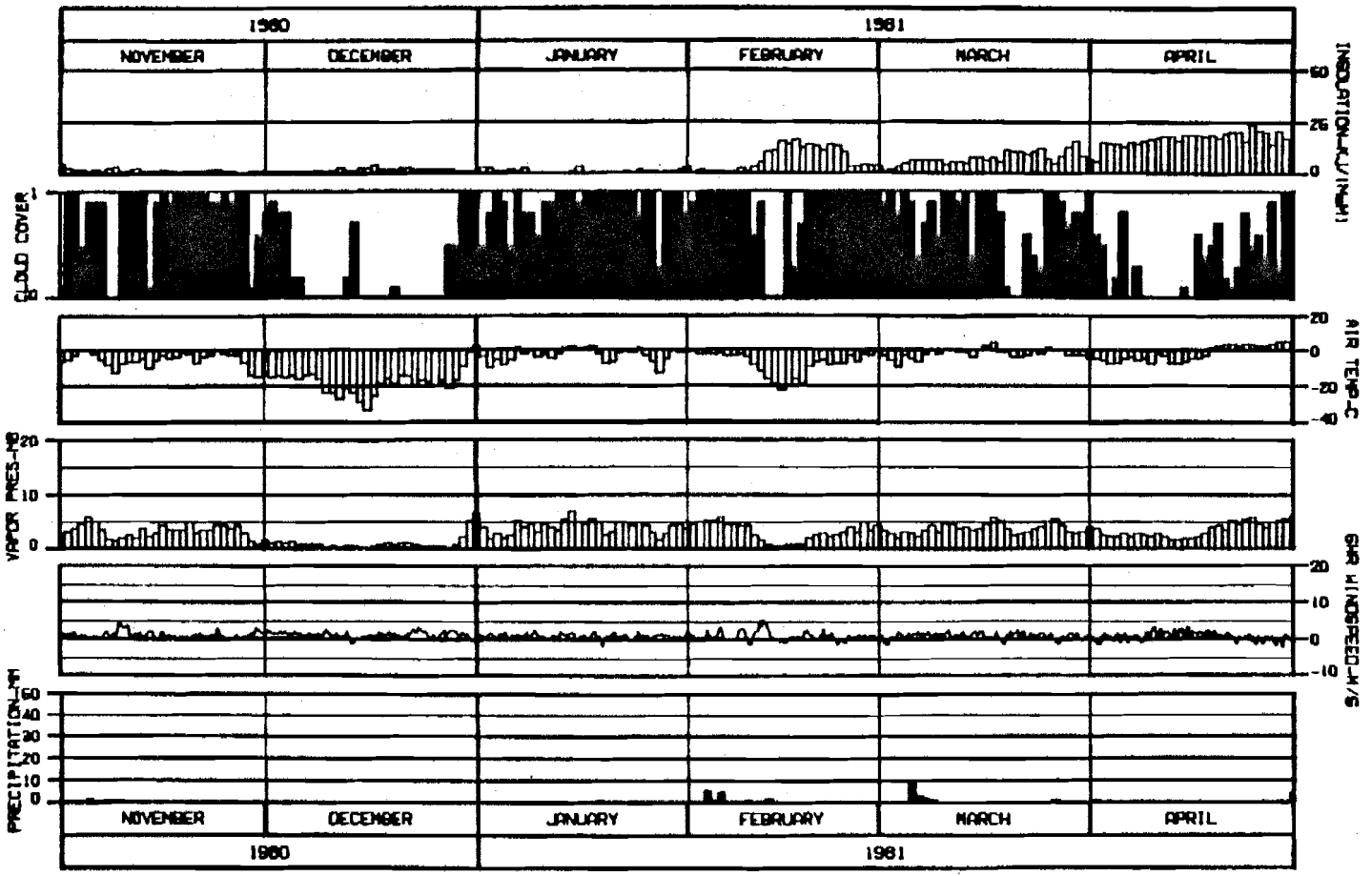
WEATHER DATA

HARZA-EBASCO JOINT VENTURE

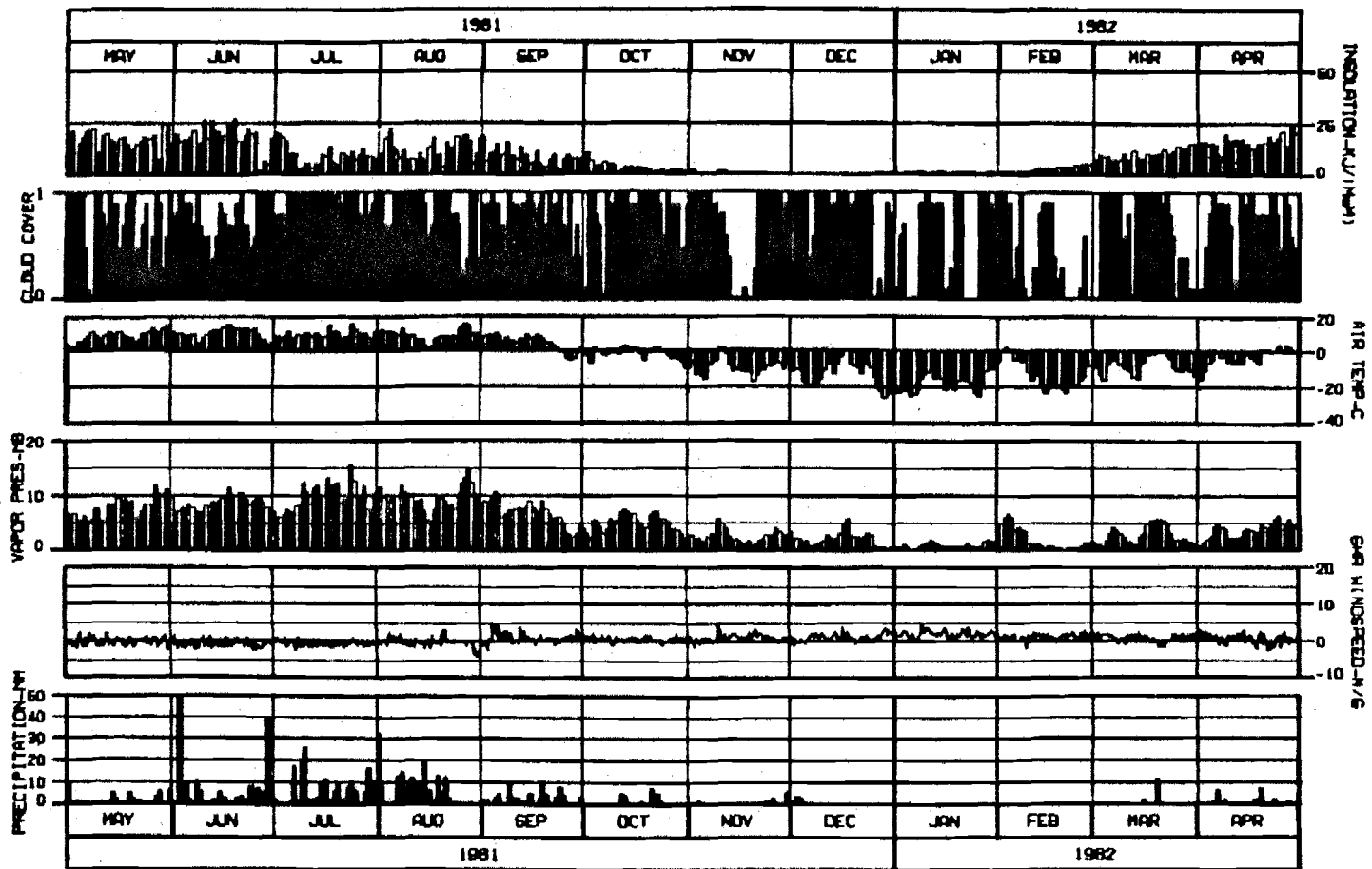
CHUCKER, BLANKS 18 JUL 83

48-843-88

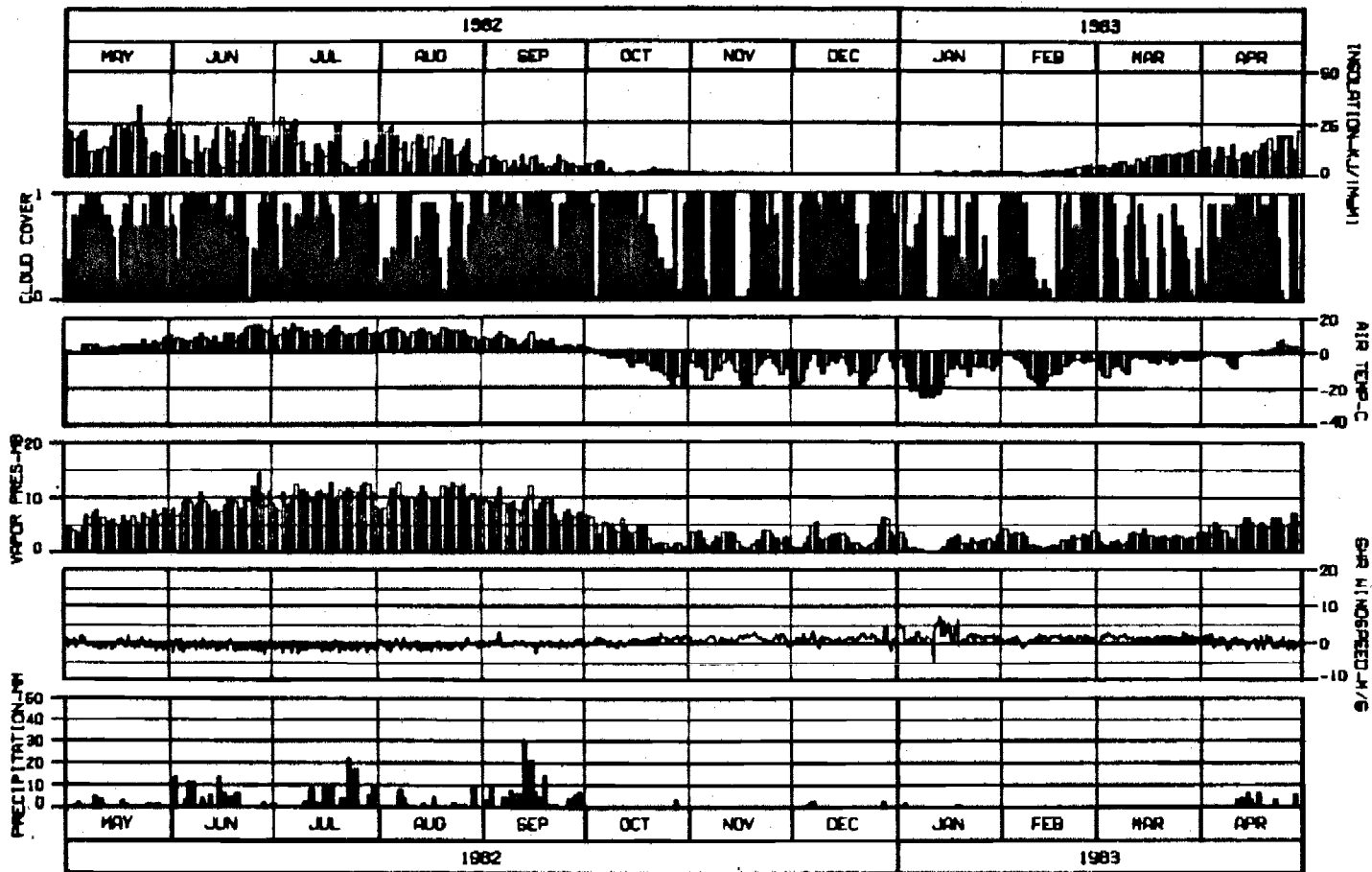
EXHIBIT C



ALASKA POWER AUTHORITY	
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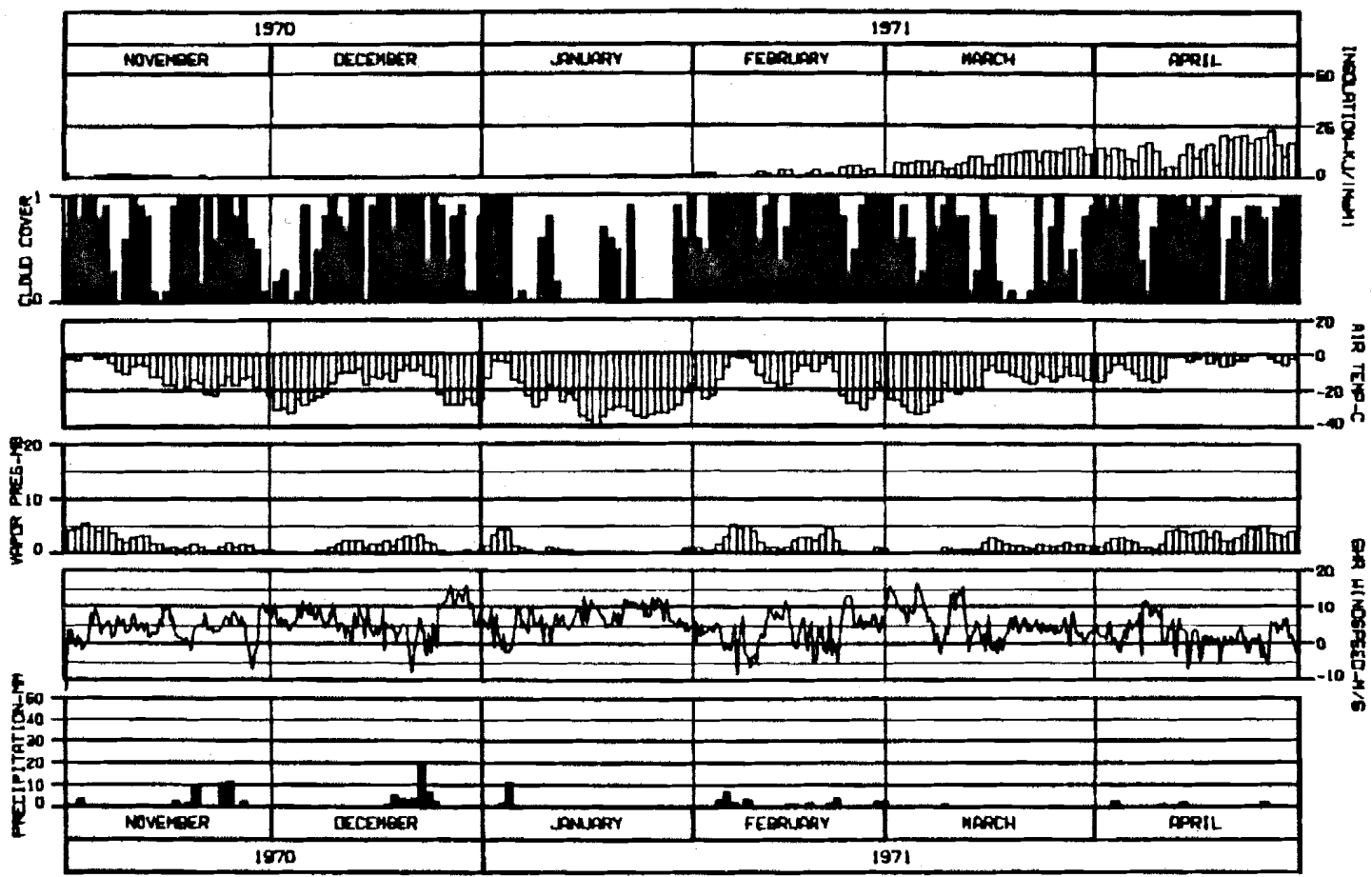


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	48-010-04

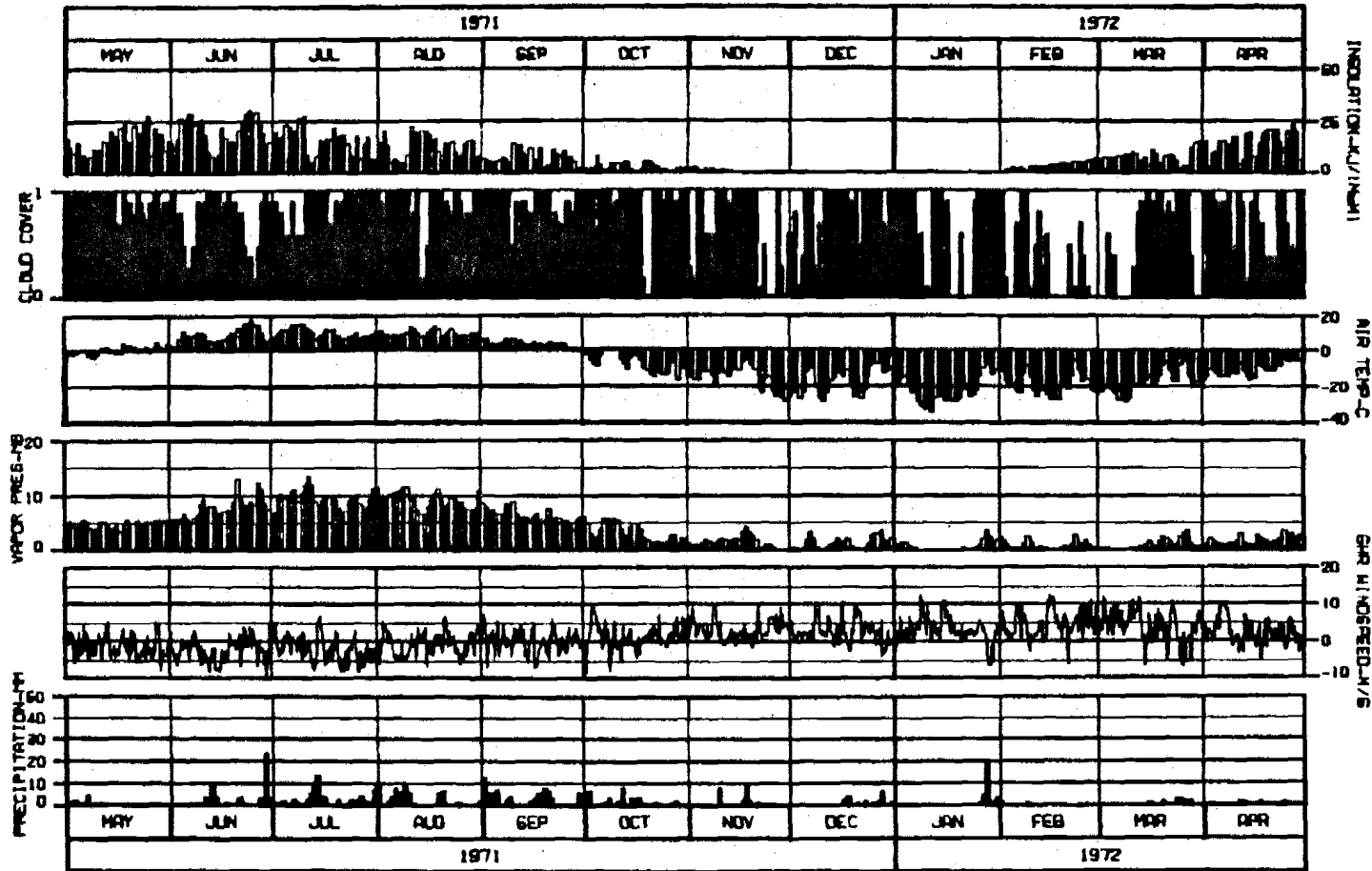


ALASKA POWER AUTHORITY	
SUBITMA PROJECT	OPENR MODEL
DEVIL CANYON RESERVOIR WEATHER DATA	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	12 JUL 84
	48-510-04

EXHIBIT D



ALASKA POWER AUTHORITY	
SUBITNA PROJECT	OPREMI MODEL
WATANA RESERVOIR WEATHER DATA	
HARZA-EBASCO JOINT VENTURE	
CHGNOB. 04.1980 17 JUL 81	48-010-04



ALASKA POWER AUTHORITY

SUBITNA PROJECT

ORDER NO.

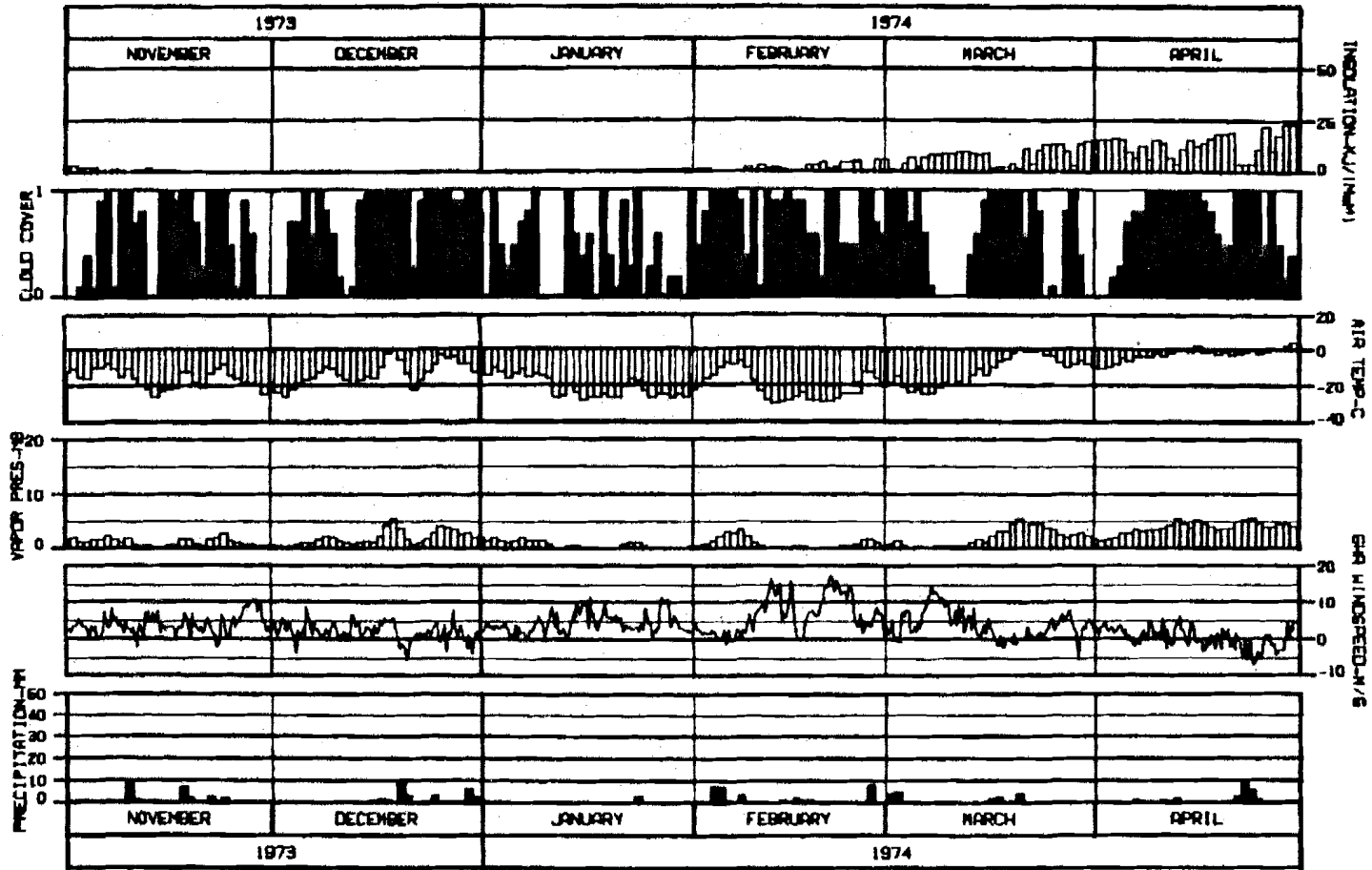
HATANA RESERVOIR
WEATHER DATA

HARZA-EBASCO JOINT VENTURE

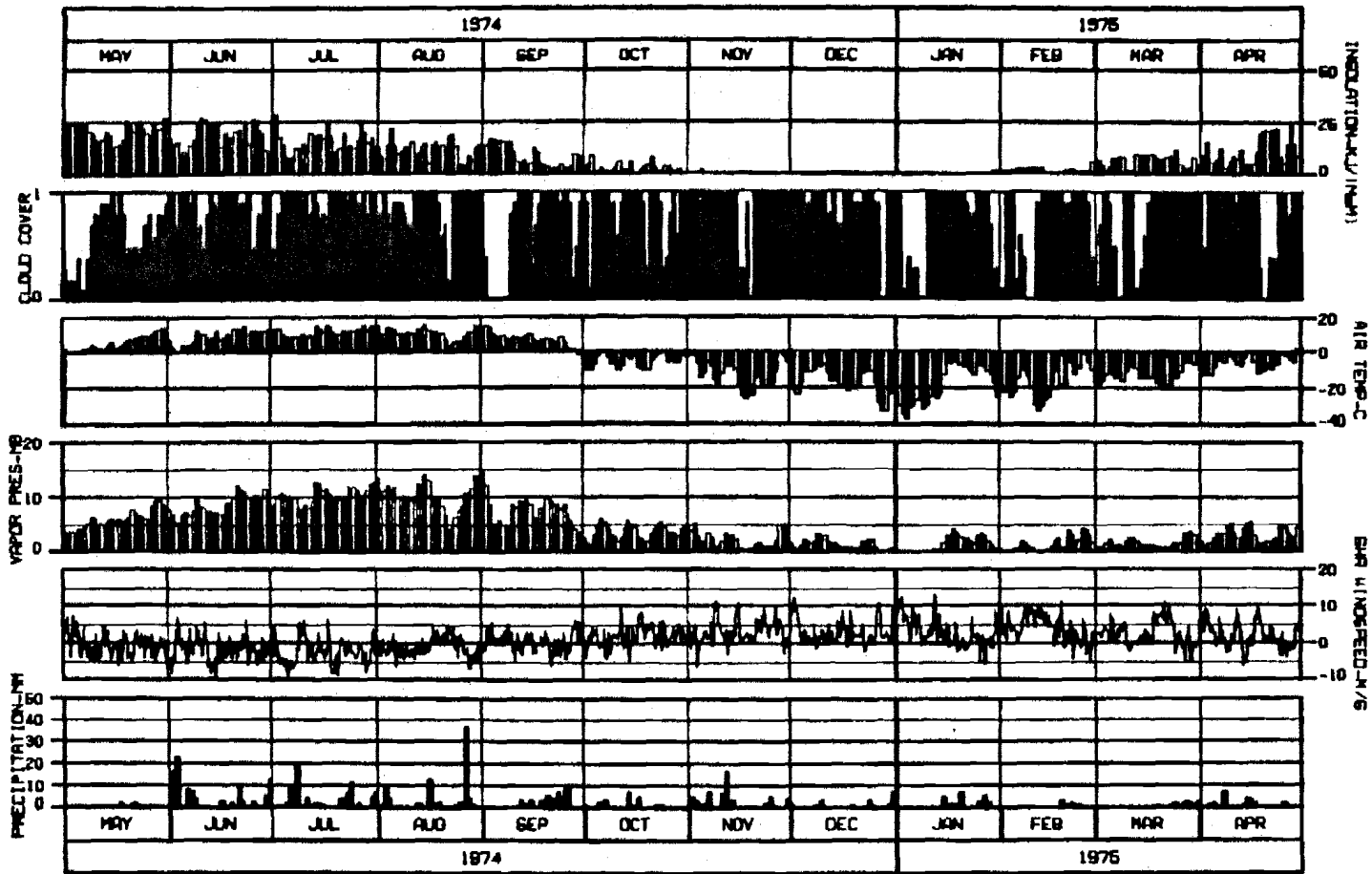
CHECKED: ALLARD

18 JUL 82

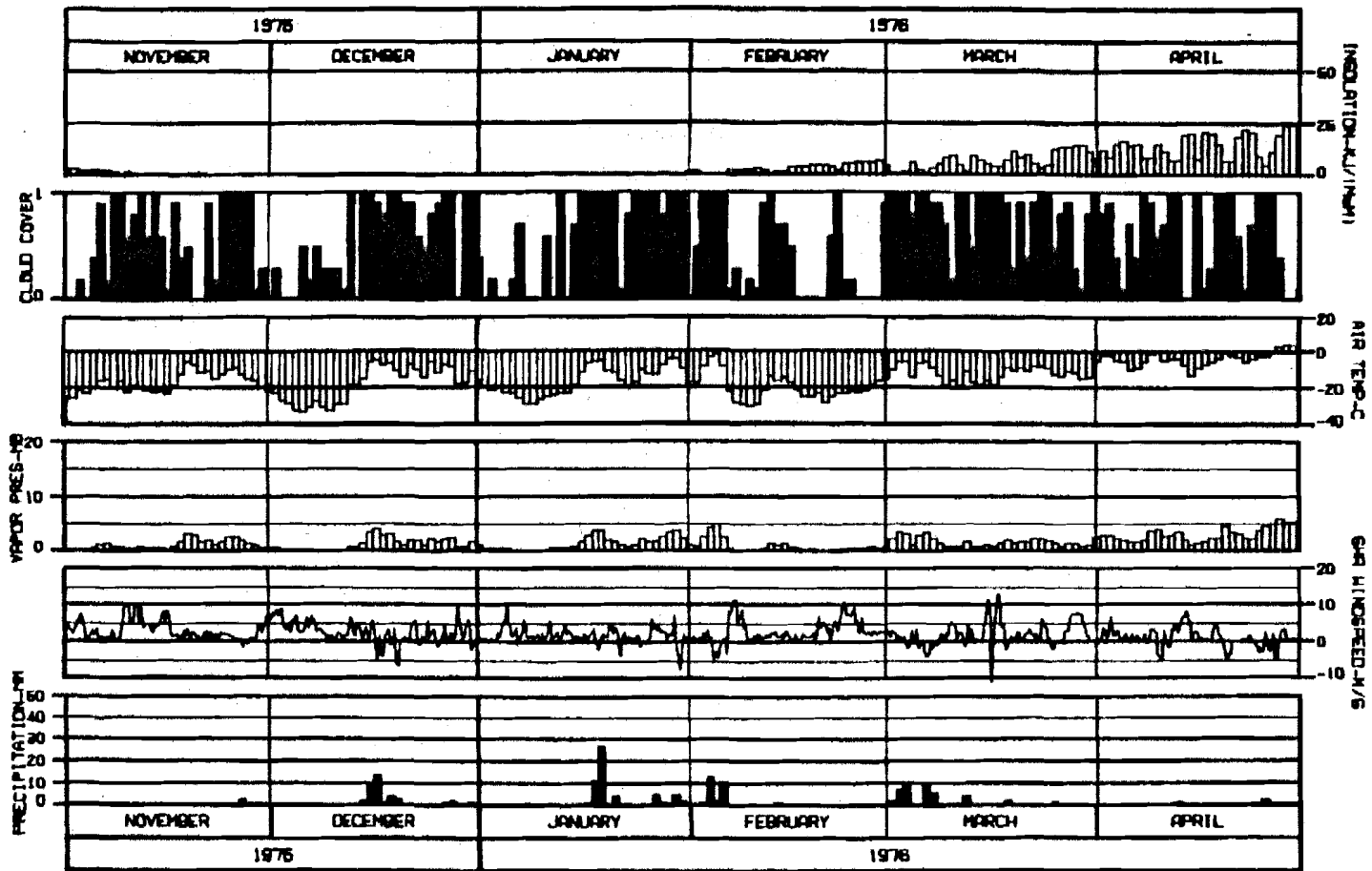
48-810-04



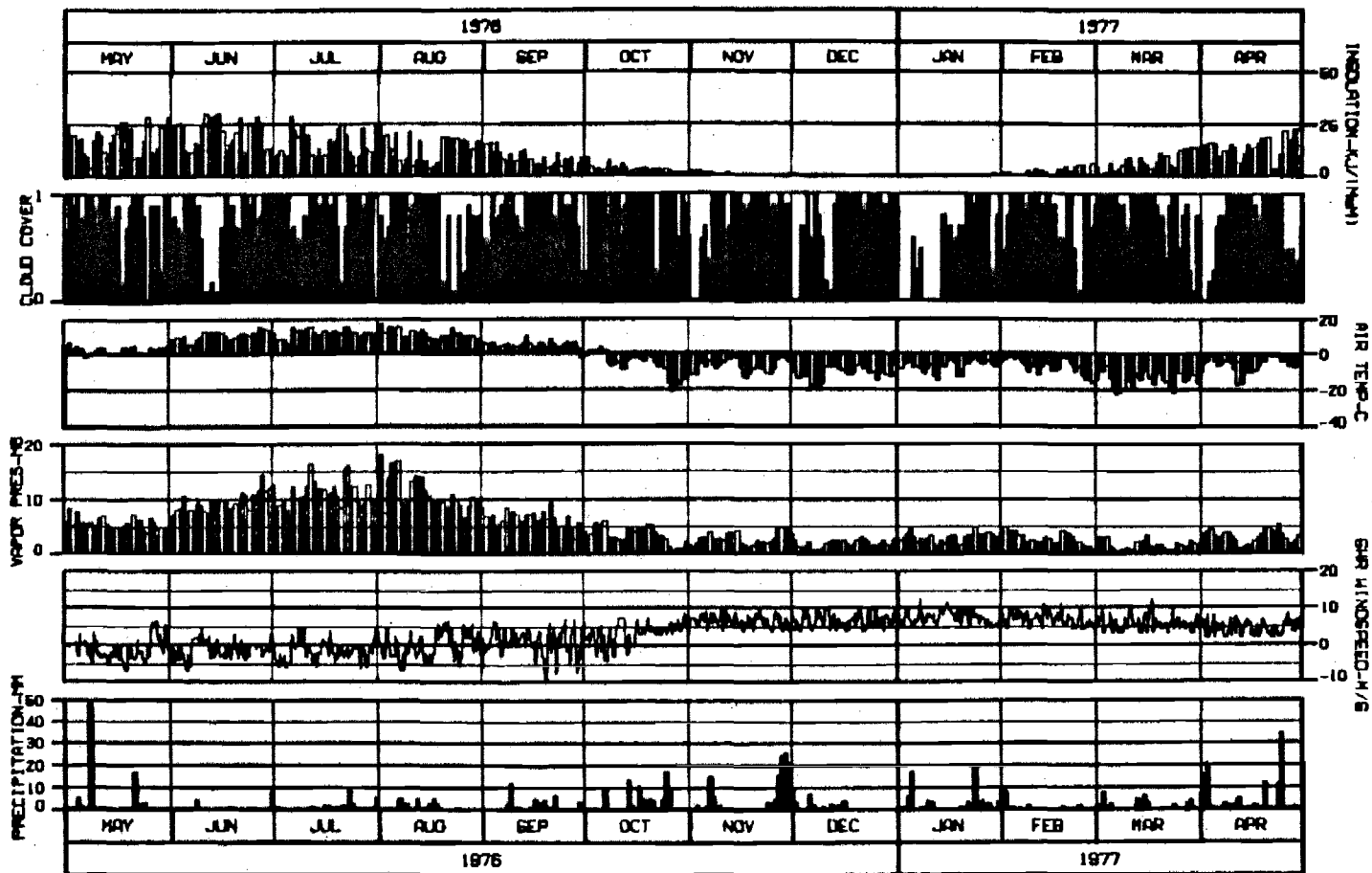
ALASKA POWER AUTHORITY	
SUBITNA PROJECT	LYREON MODEL
WATANA RESERVOIR WEATHER DATA	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS 19 JUL 84	45-210-04



ALASKA POWER AUTHORITY		
SUBTINA PROJECT	DYNESH MODEL	
WATANA RESERVOIR WEATHER DATA		
HARZA-EBASCO JOINT VENTURE		
DOCNO: ALP002	18 JAN 84	48-810-04



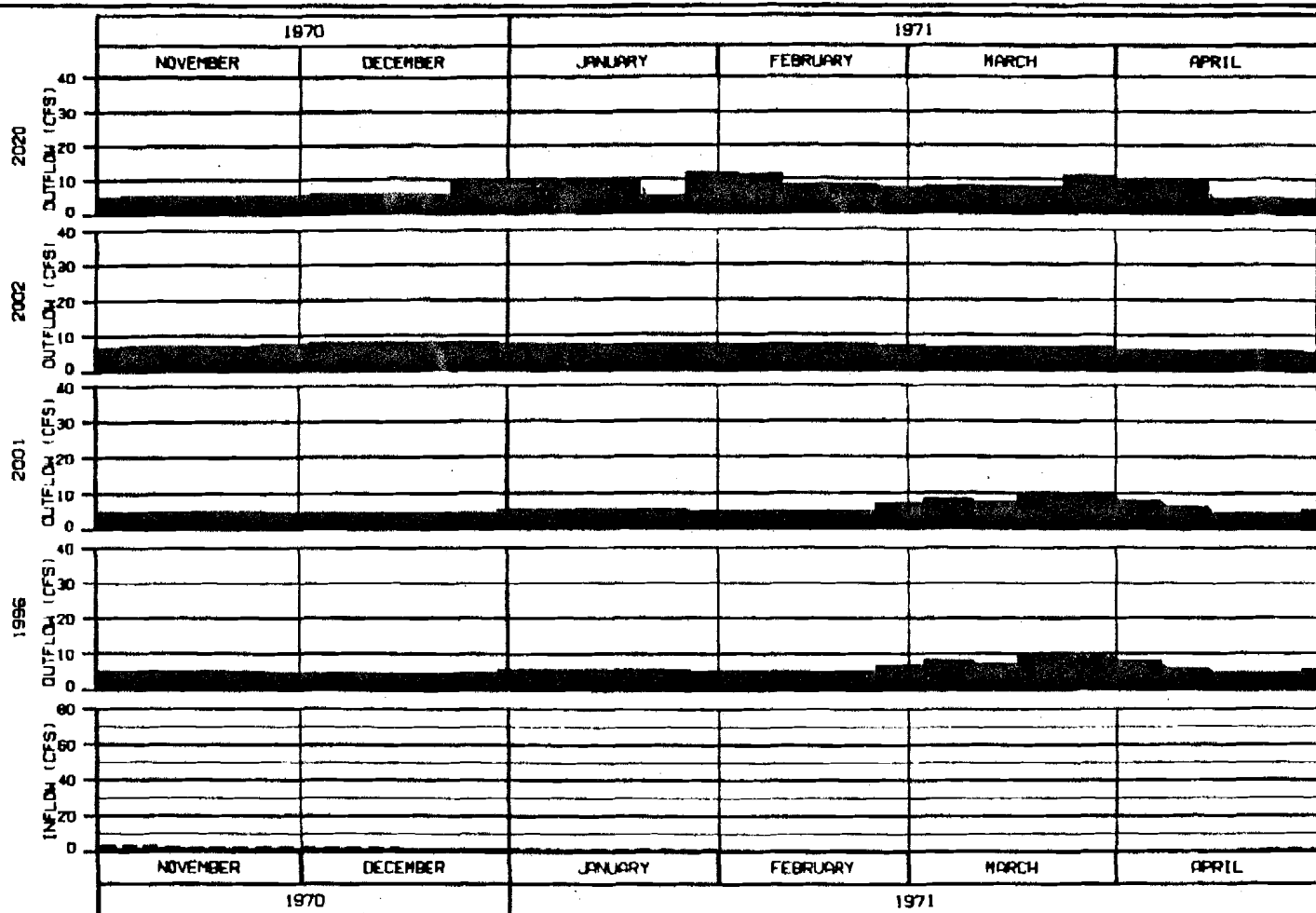
ALASKA POWER AUTHORITY	
SUBITMA PROJECT	DYNOSH MODEL
WATANA RESERVOIR WEATHER DATA	
HARZA-EBASCO JOINT VENTURE	
DESIGNER: S.A. INSTITUTE	12 JUL 84 48-210-04



ALASKA POWER AUTHORITY	
SUBITNA PROJECT	DYRESH HEDEL
WATANA RESERVOIR WEATHER DATA	
HARZA-EBASCO JOINT VENTURE	
DATE: 18 JUL 84	AL-810-84

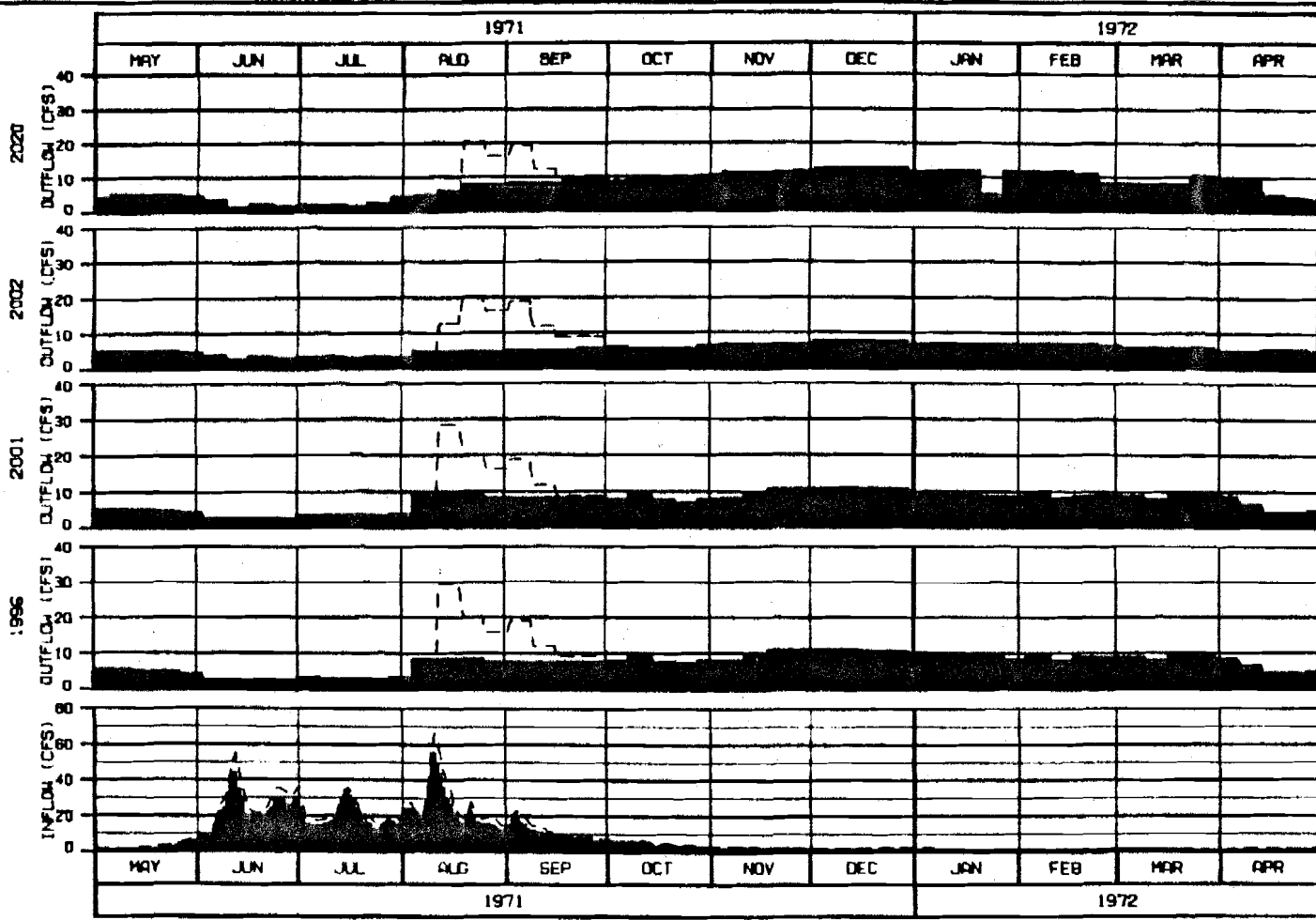
Reservoir Inflow and Outflow Data

EXHIBIT E



LEGEND:
 ■■■■■ INFLON ■■■■■
 ■■■■■ SUSITNA RIVER
 - - - - - SUSITNA + TRIBUTARY
 ■■■■■ OUTFLOW ■■■■■
 ■■■■■ POWERHOUSE
 - - - - - POWERHOUSE + CONE VALVE
 - - - - - POWERHOUSE + CONE VALVE + SPILLWAY

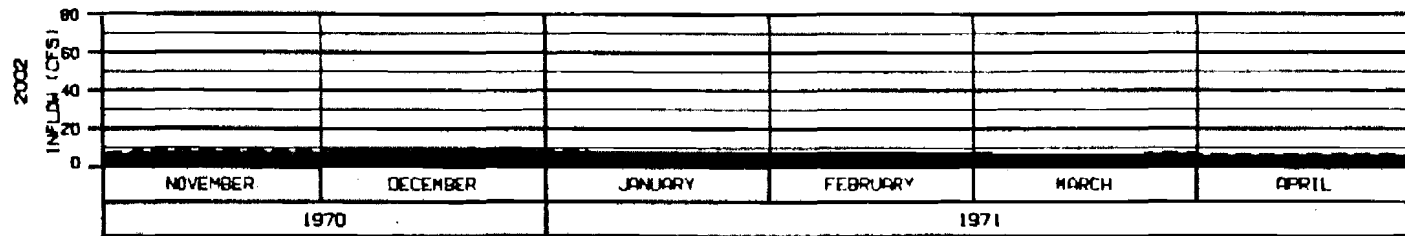
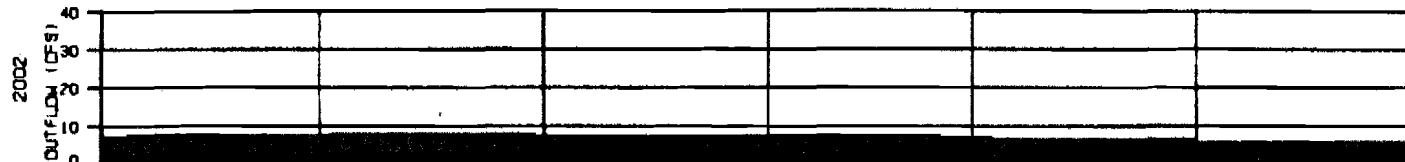
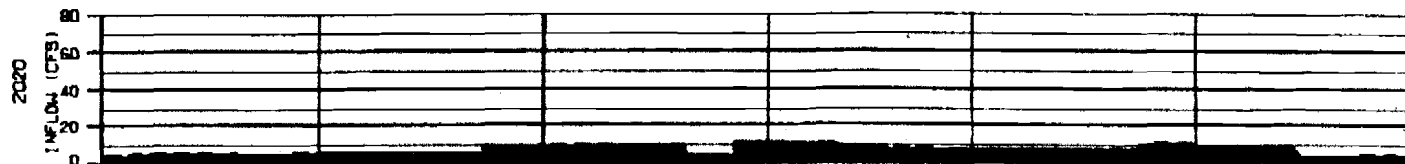
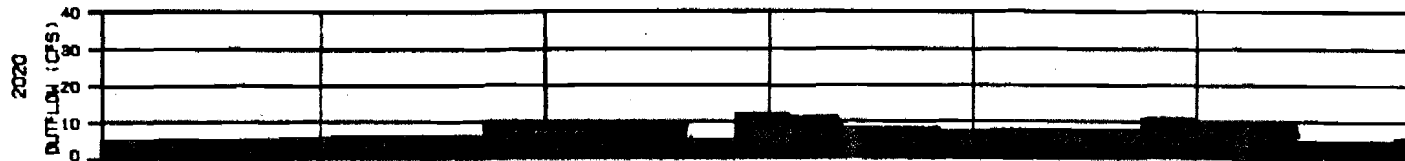
ALASKA POWER AUTHORITY	
SUSITNA PROJECT	UPRESH MODEL
WATANA RESERVOIR INFLOW AND OUTFLOW	
MARZA-EBASCO JOINT VENTURE	
CNCR00 - ILLI01B	18 JAN 84
48-010-04	



LEGEND: INFLOW OUTFLOW
 ■ SUBITNA RIVER
 - - - SUBITNA + TRIBUTARY
 ■ POWERHOUSE
 - - - POWERHOUSE + CONE VALVE
 - - - POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY	
SUBITNA PROJECT	DYRESA MODEL
WATANA RESERVOIR INFLOW AND OUTFLOW	
WARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	18 JUL 84
48-010.04	

EXHIBIT F



LEGEND: INFLOW

SUSITNA RIVER (FROM WATANA)

SUSITNA + TRIBUTARY

OUTFLOW

POWERHOUSE

POWERHOUSE + CONE VALVE

POWERHOUSE + CONE VALVE + SPILLWAY

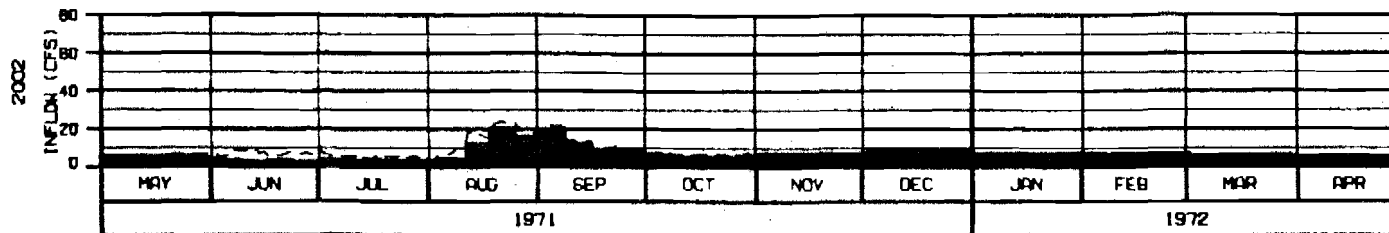
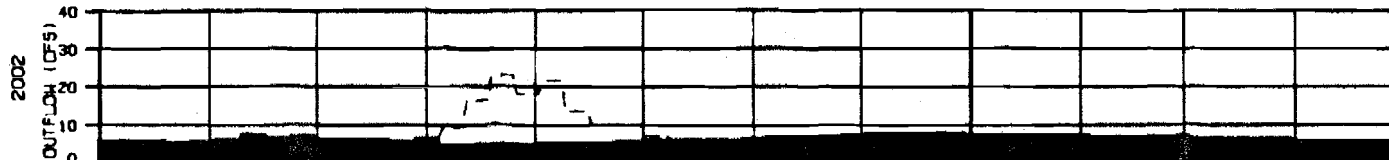
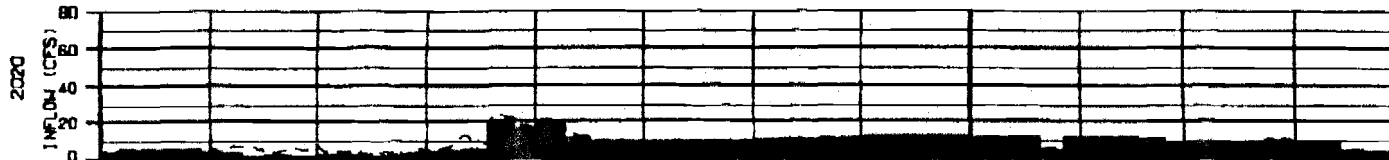
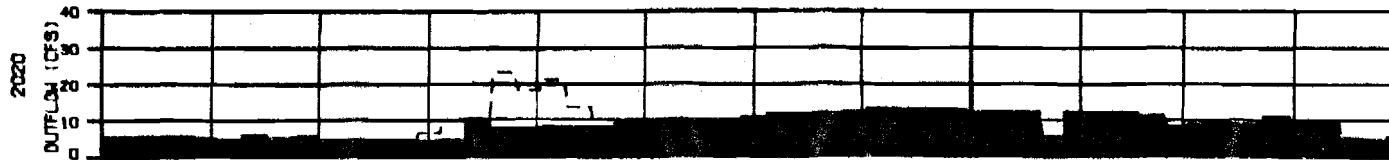
ALASKA POWER AUTHORITY

SUSITNA PROJECT DYRESM MODEL

DEVIL CANYON RESERVOIR
INFLOW AND OUTFLOW

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILL. 60611 18 JUL 84 48-010-04



LEGEND:

INFLOW

SUSITNA RIVER (FROM WATONA)
SUSITNA + TRIBUTARY

OUTFLOW

POWERHOUSE
POWERHOUSE + CONE VALVE
POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY

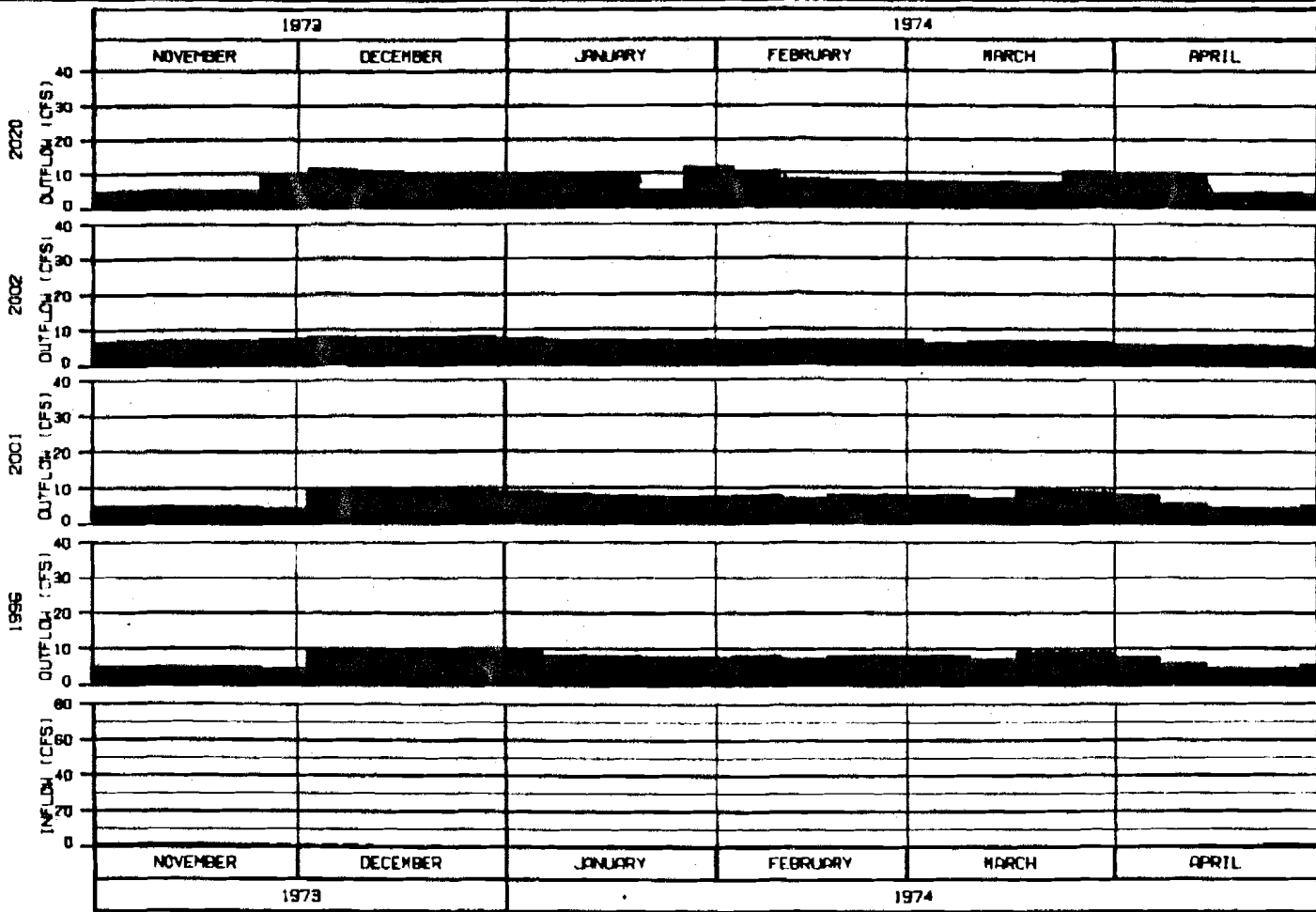
SUSITNA PROJECT CYRUSH MODEL

DEVIL CANYON RESERVOIR
INFLOW AND OUTFLOW

HARZA-EBASCO JOINT VENTURE

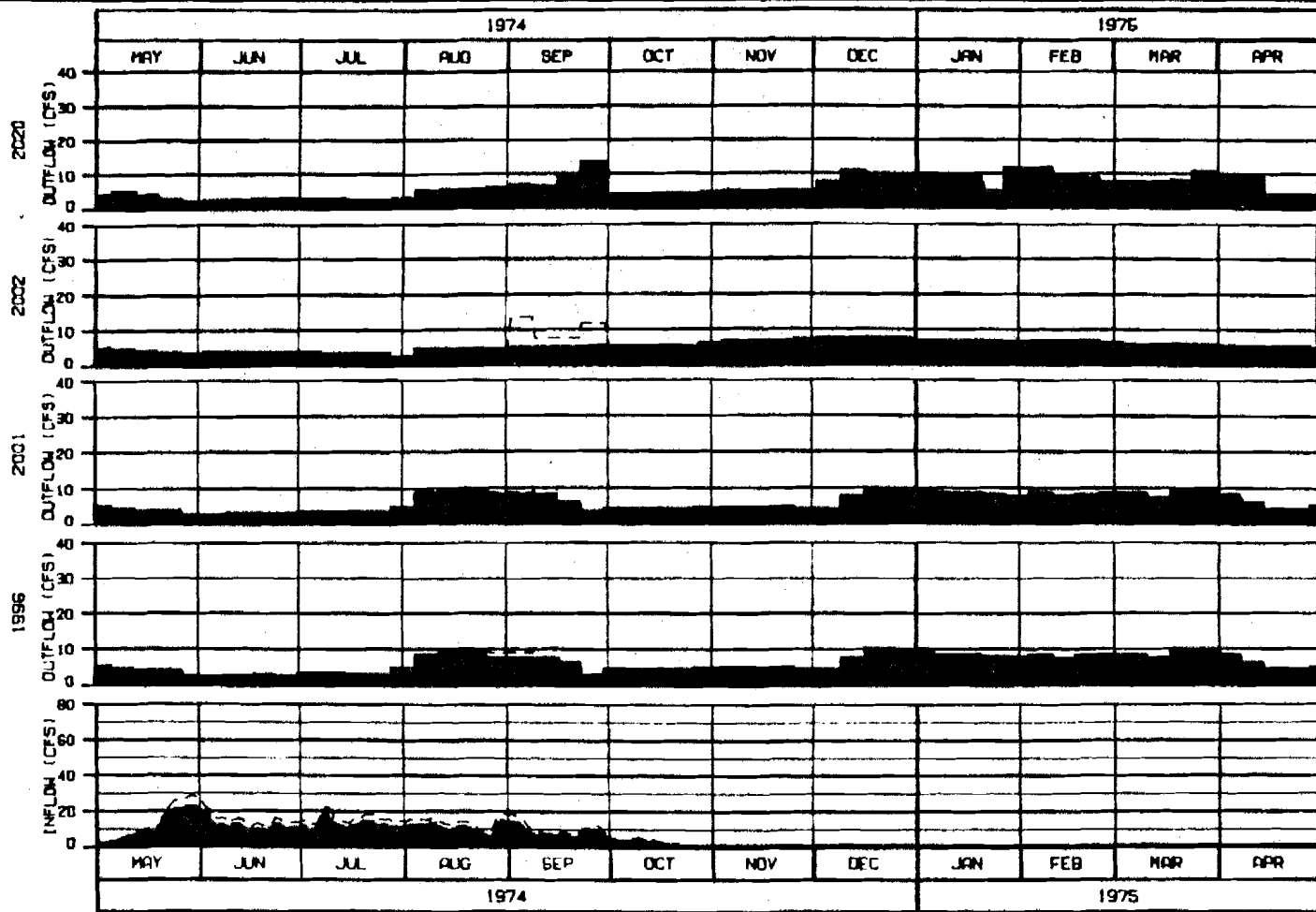
CHICAGO - ILLINOIS 18 JUL 84 48-010-84

EXHIBIT G



LEGEND: ===== INFLOW =====
 ■■■■■■ BUSITNA RIVER
 - - - - - BUSITNA + TRIBUTARY
 ===== OUTFLOW =====
 ■■■■■■ POWERHOUSE
 - - - - - POWERHOUSE + CONE VALVE
 - - - - - POWERHOUSE + CONE VALVE + SPILLWAY

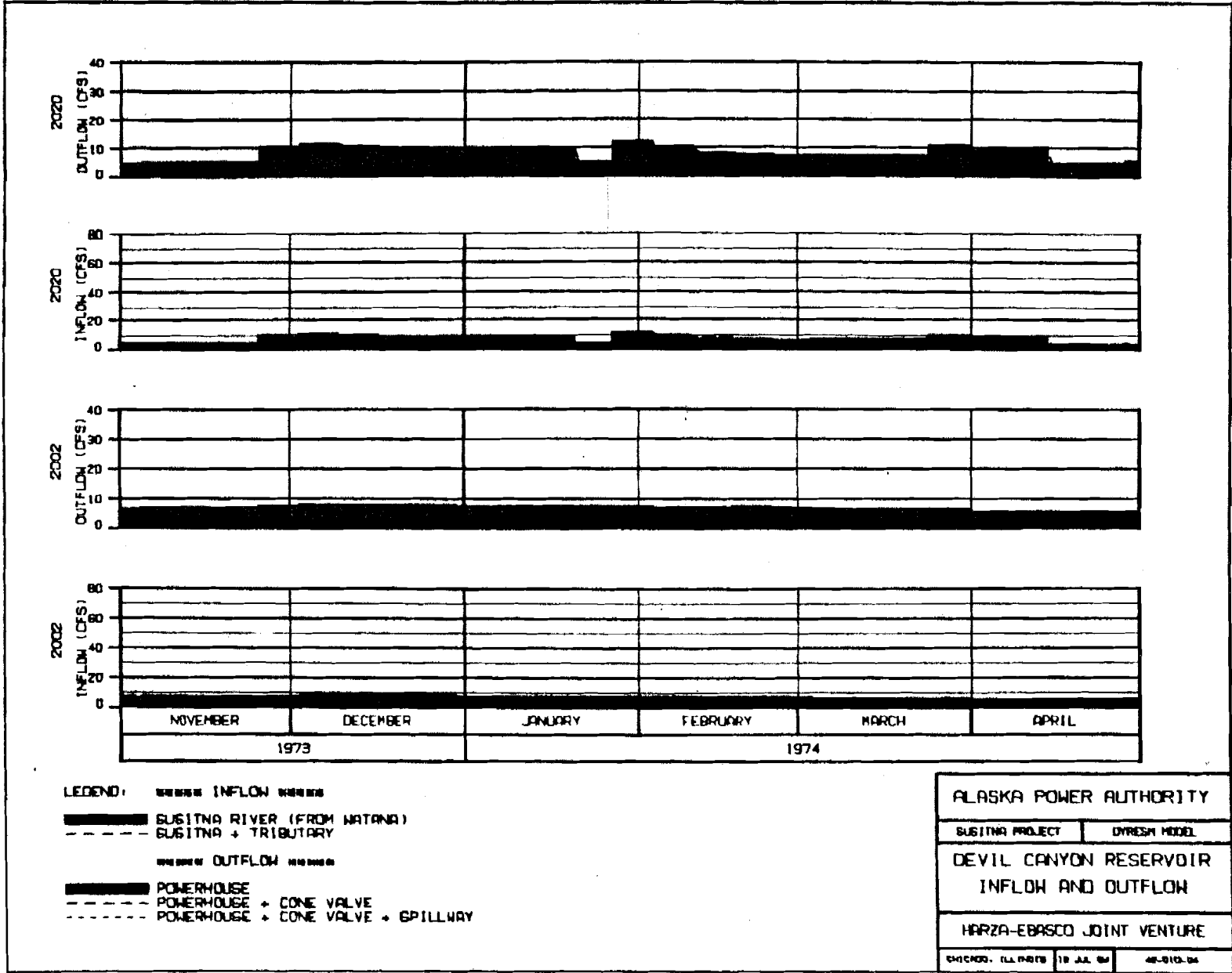
ALASKA POWER AUTHORITY
 SUBITNA PROJECT DYRESH MODEL
 WATANA RESERVOIR
 INFLOW AND OUTFLOW
 HARZA-EBASCO JOINT VENTURE
 CHICAGO, ILL. 60619 18 JAN 84 48-910-04



LEGEND: ===== INFLOW =====
 ■■■■■ SUSITNA RIVER
 - - - - - SUSITNA + TRIBUTARY
 ===== OUTFLOW =====
 ■■■■■ POWERHOUSE
 - - - - - POWERHOUSE + CONE VALVE
 POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY		
SUSITNA PROJECT	DYRESHA MODEL	
WATANA RESERVOIR INFLOW AND OUTFLOW		
MARZA-EBASCO JOINT VENTURE		
CHICAGO, ILLINOIS	18 JUL 84	48-810-04

EXHIBIT H



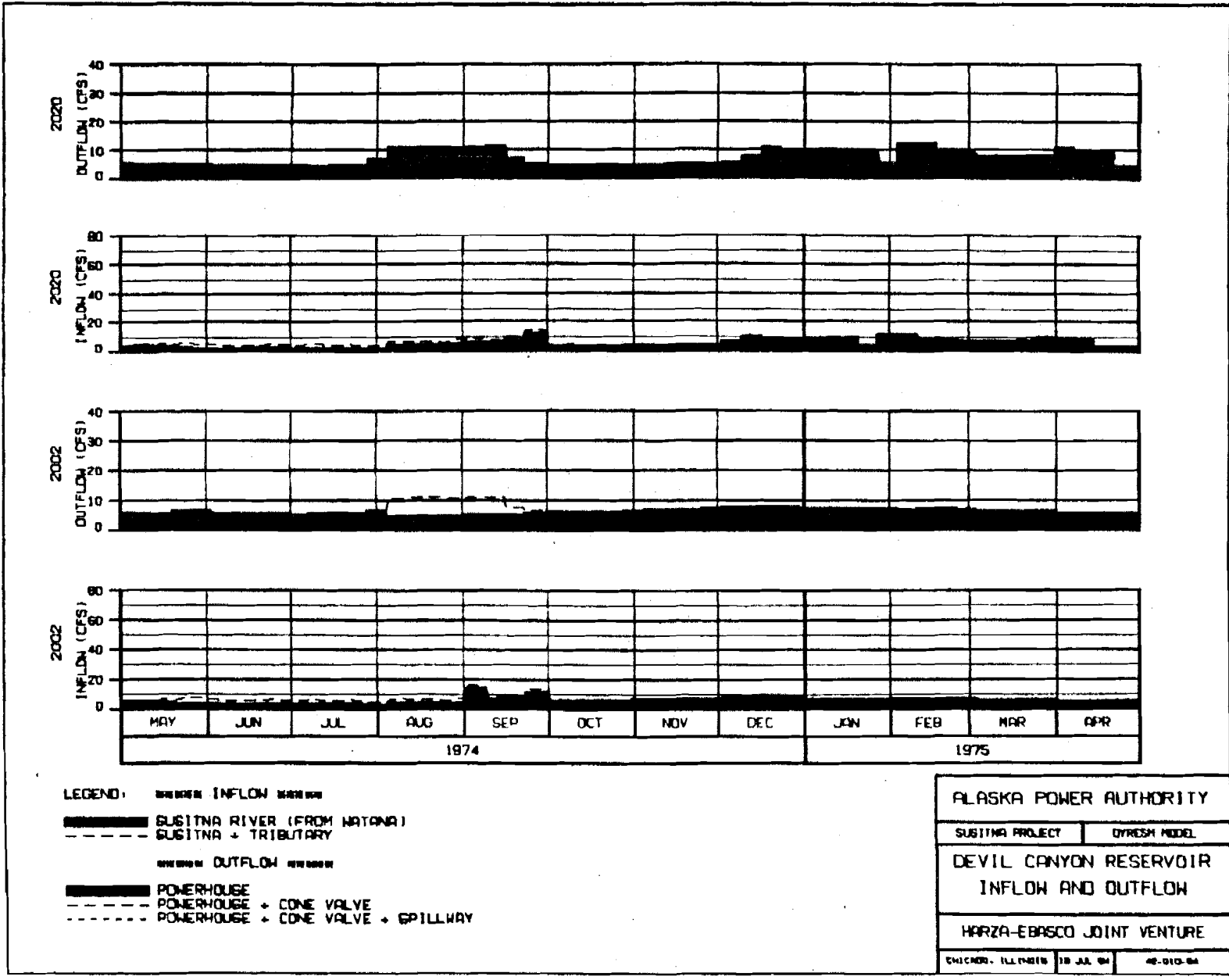
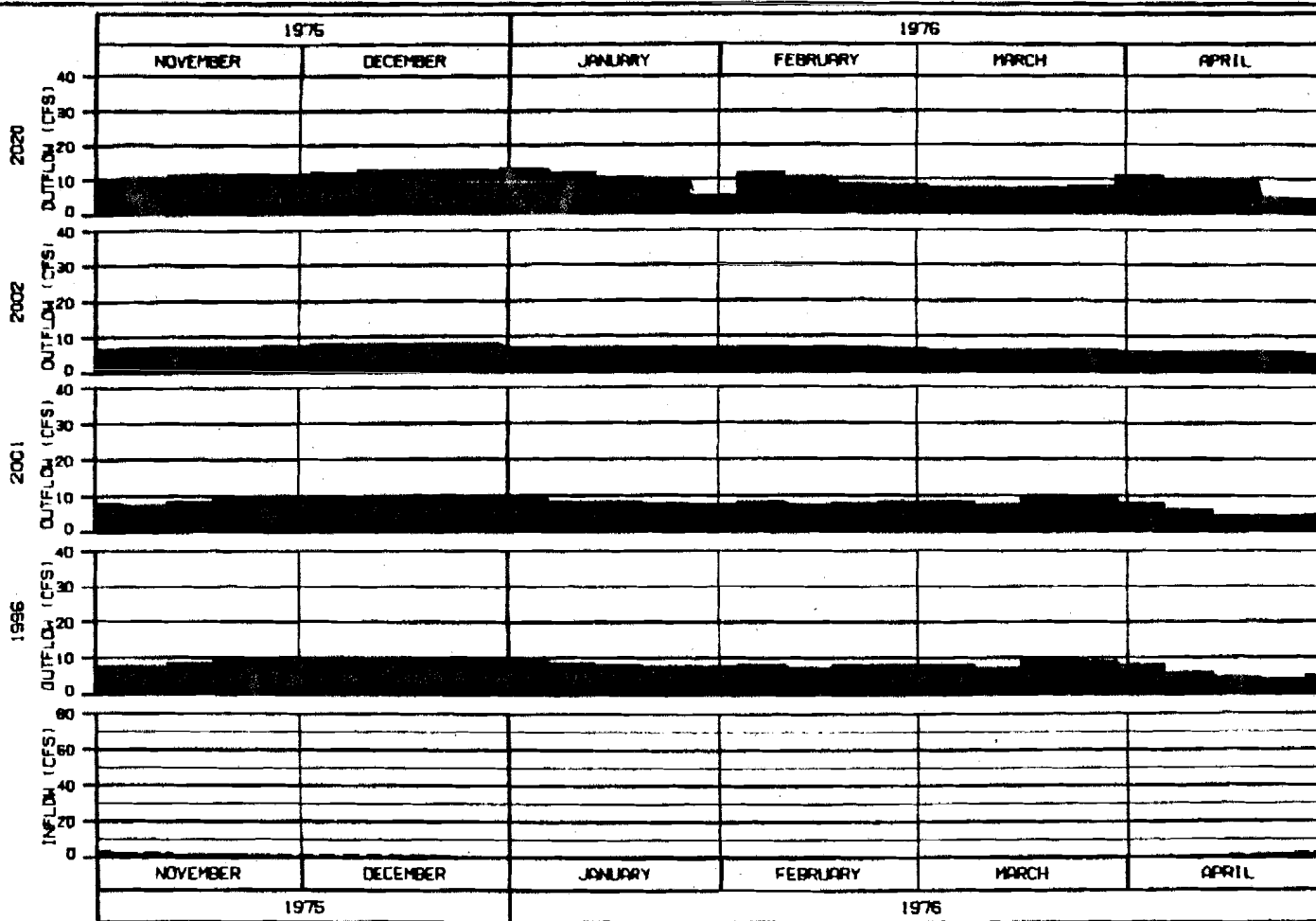
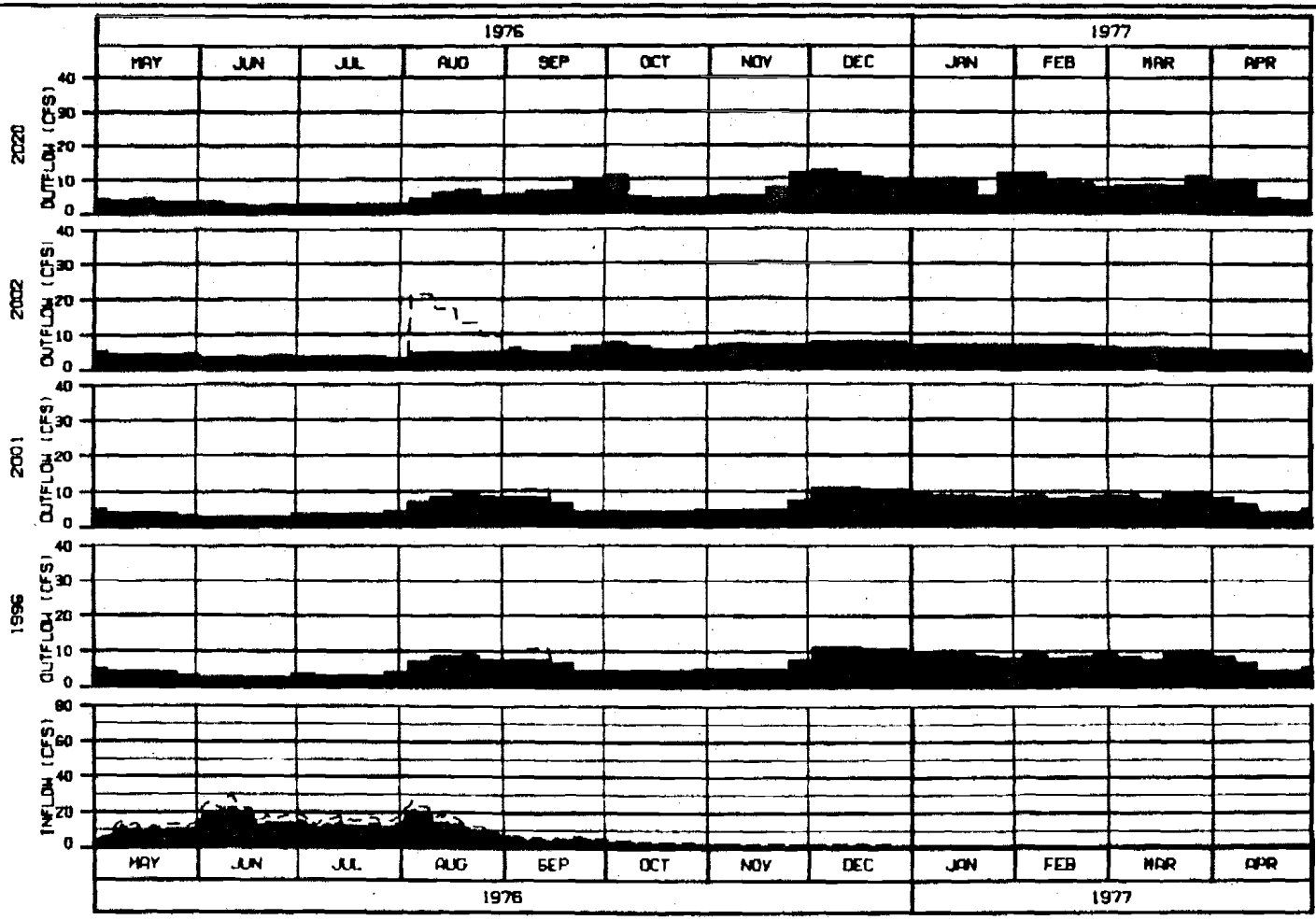


EXHIBIT I



LEGEND:
 ■■■■■ INFLOW ■■■■■
 ■■■■■ SUSITNA RIVER
 - - - - SUSITNA + TRIBUTARY
 ■■■■■ OUTFLOW ■■■■■
 ■■■■■ POWERHOUSE
 - - - - POWERHOUSE + CONE VALVE
 - - - - POWERHOUSE + CONE VALVE + SPILLWAY

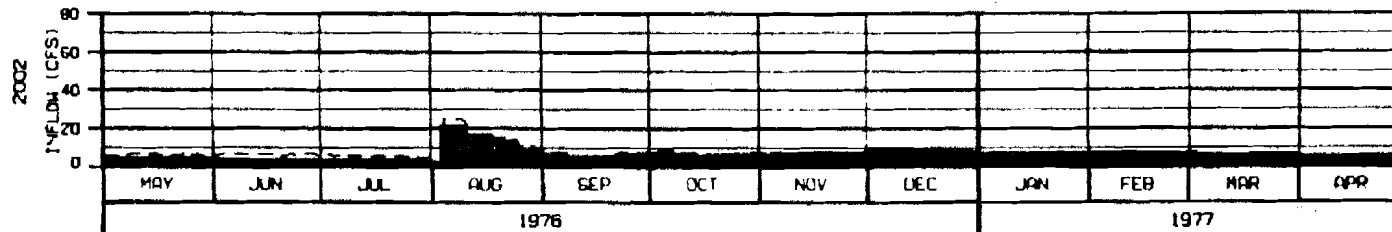
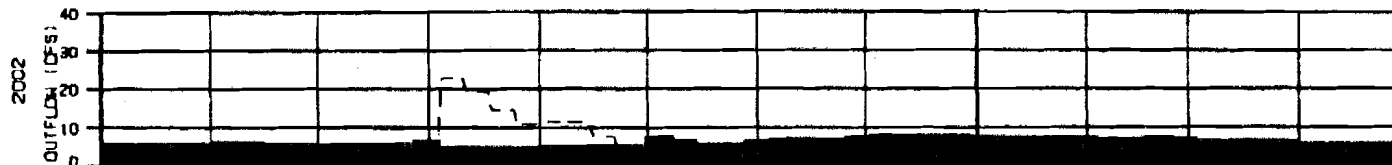
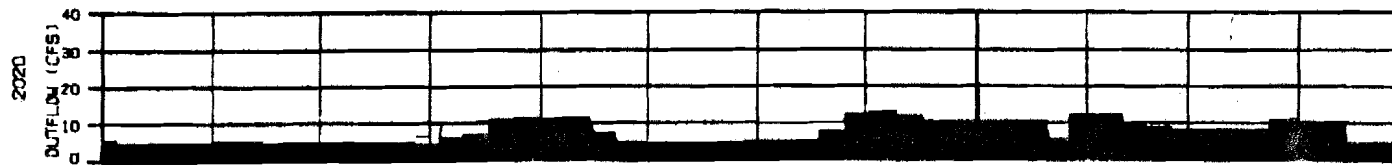
ALASKA POWER AUTHORITY
 SUSITNA PROJECT OYPRESA MODEL
 WATANA RESERVOIR
 INFLOW AND OUTFLOW
 HARZA-EBASCO JOINT VENTURE
 CHECKED: ALLIEN 18 JAN 84 49-010-04



LEGEND:
 ■■■■■ INFLOW ■■■■■
 ■■■■■ SUSITNA RIVER
 - - - - SUSITNA + TRIBUTARY
 ■■■■■ OUTFLOW ■■■■■
 ■■■■■ POWERHOUSE
 - - - - POWERHOUSE + CONE VALVE
 - - - - POWERHOUSE + CONE VALVE + SPILLWAY

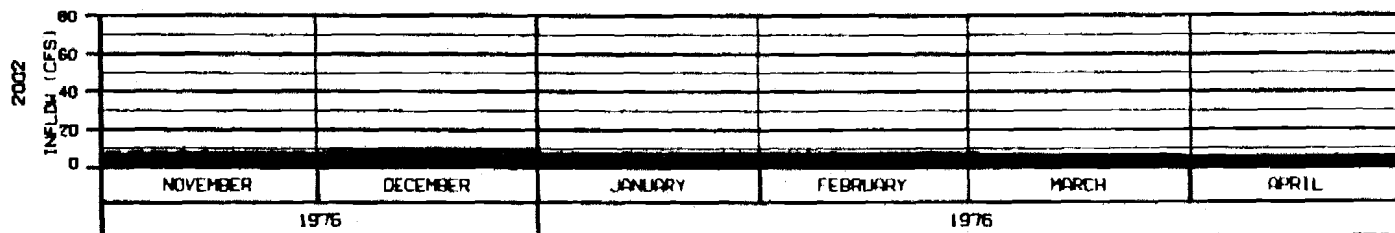
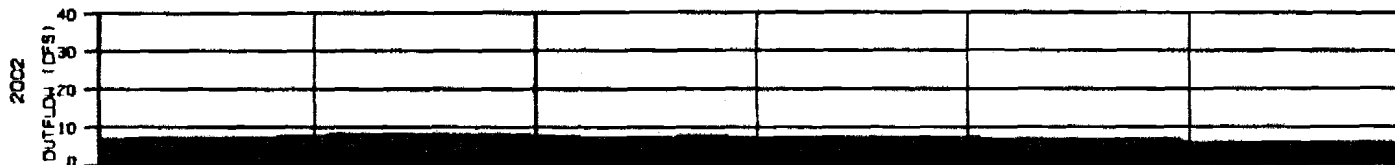
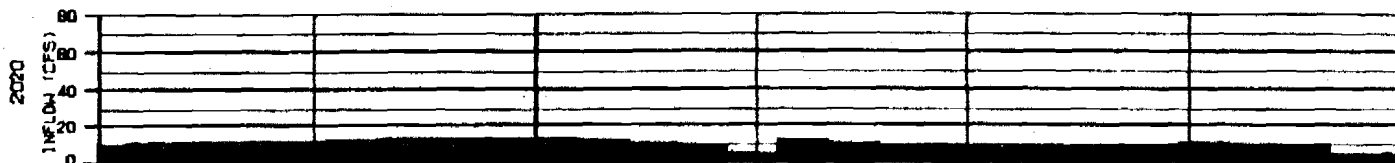
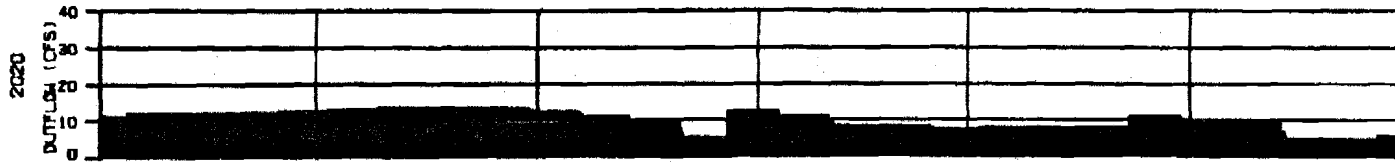
ALASKA POWER AUTHORITY	
SUSITNA PROJECT	HYDRO MODEL
WATANA RESERVOIR	
INFLOW AND OUTFLOW	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILL. (DATE)	12 JUL 84
	49-010-94

EXHIBIT J



LEGEND: ■■■■■ INFLOW ■■■■■
 ■■■■■ SUSITNA RIVER (FROM WATANA)
 - - - - SUSITNA + TRIBUTARY
 ■■■■■ OUTFLOW ■■■■■
 ■■■■■ POWERHOUSE
 - - - - POWERHOUSE + CONE VALVE
 - - - - POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY		
SUSITNA PROJECT	DYRESH MODEL	
DEVIL CANYON RESERVOIR INFLOW AND OUTFLOW		
HARZA-EBASCO JOINT VENTURE		
CHICAGO, ILLINOIS	18 JUL 84	48-010-04



LEGEND:

SUSITNA RIVER (FROM NATANA)
 SUSITNA + TRIBUTARY
 SUSITNA + TRIBUTARY + SPILLWAY
 POWERHOUSE
 POWERHOUSE + CONE VALVE
 POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY

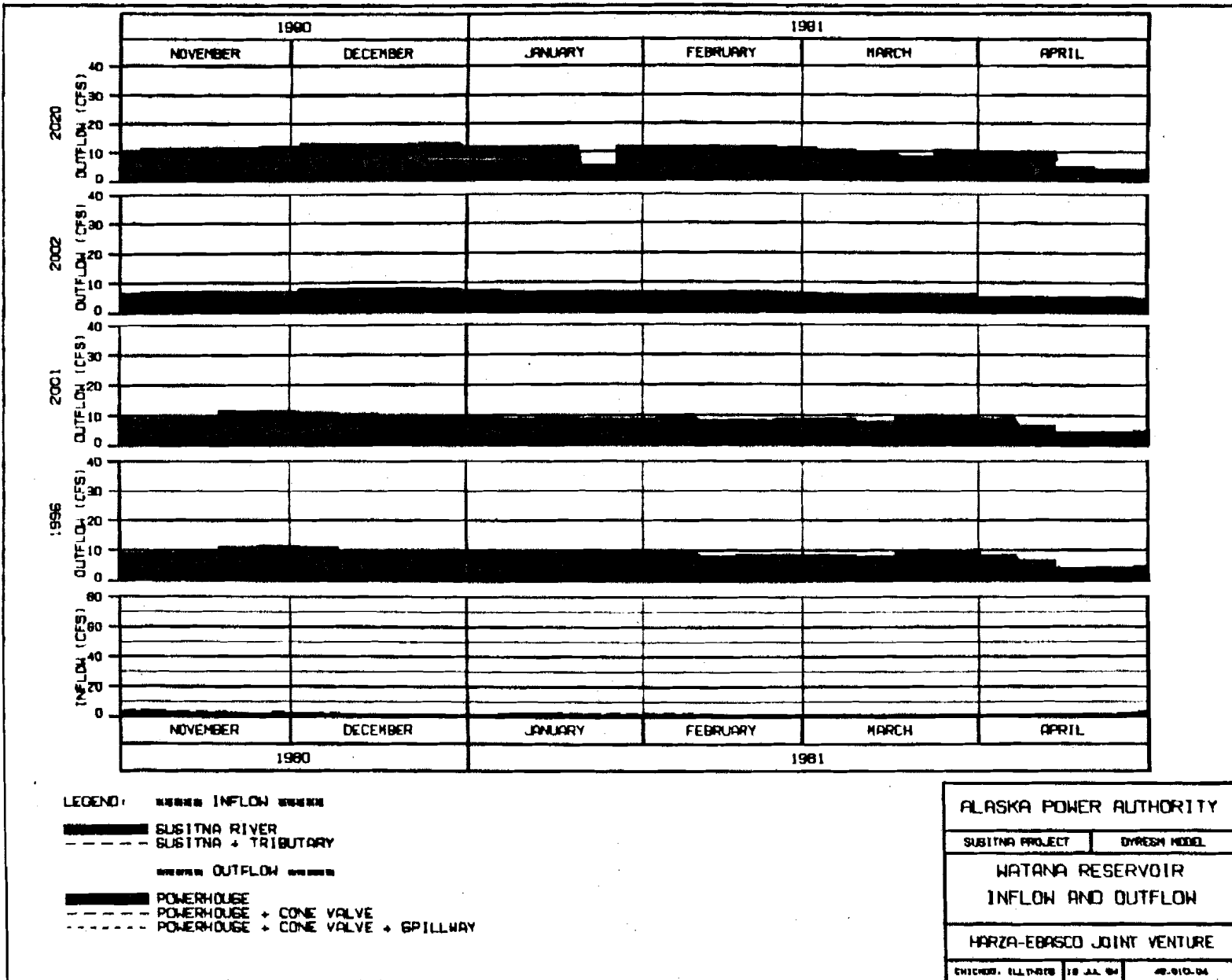
SUSITNA PROJECT DYRESM MODEL

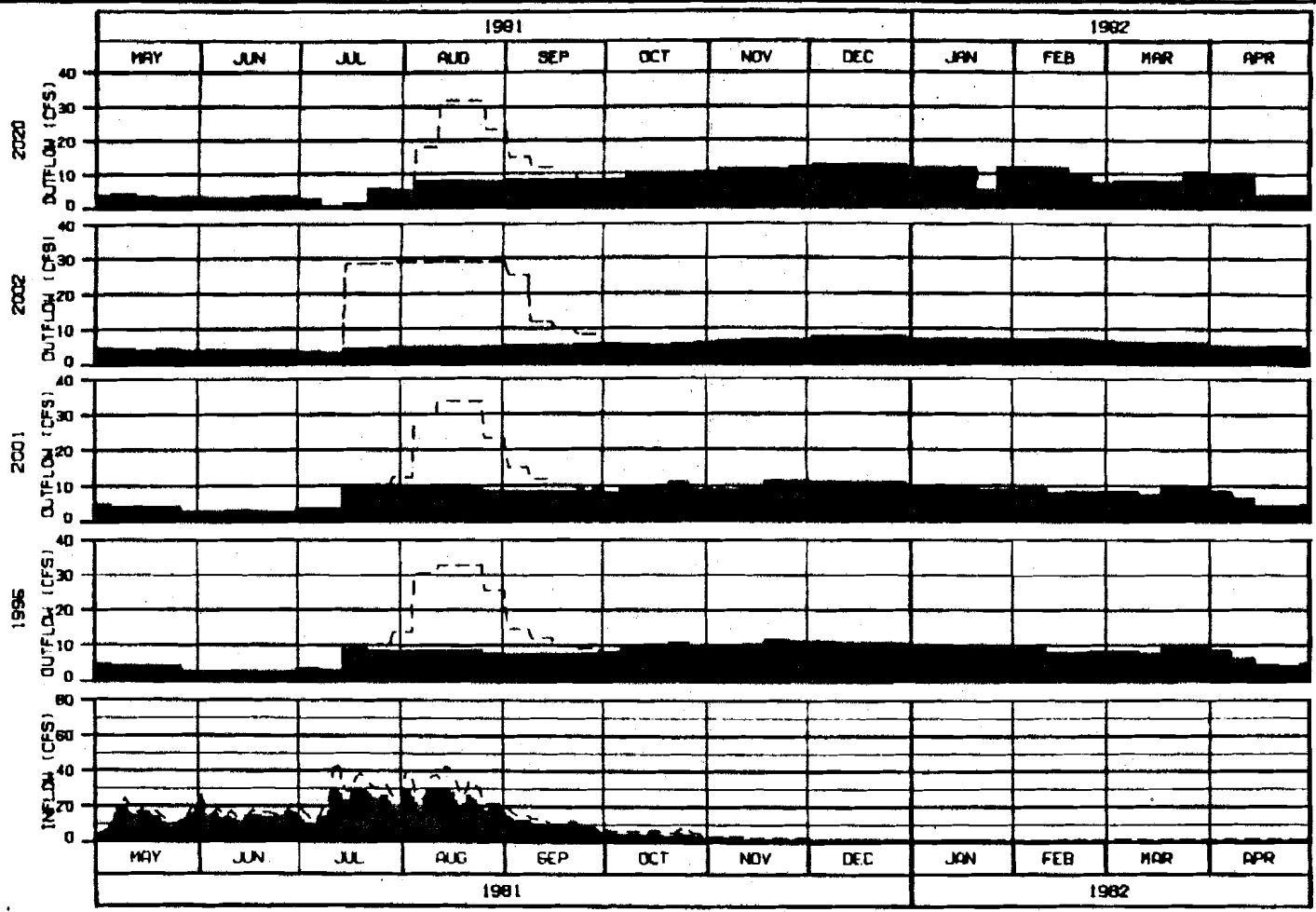
DEVIL CANYON RESERVOIR
INFLOW AND OUTFLOW

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS 19 JUL 84 42-010-04

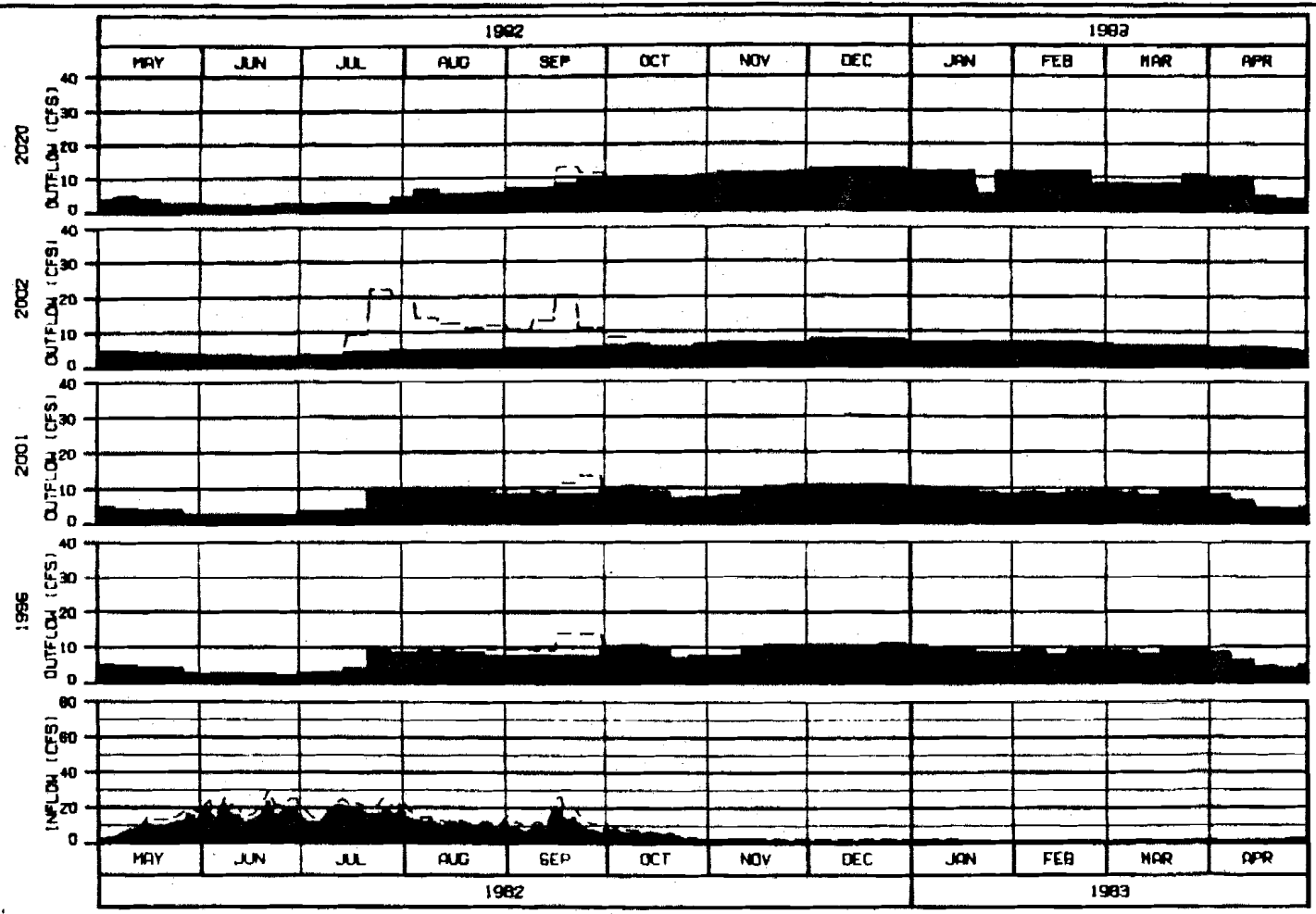
EXHIBIT K





LEGEND:
 ■■■■■ INFLOW ■■■■■
 ■■■■■ SUSITNA RIVER
 - - - - SUSITNA + TRIBUTARY
 ■■■■■ OUTFLOW ■■■■■
 ■■■■■ POWERHOUSE
 - - - - POWERHOUSE + CONE VALVE
 - - - - POWERHOUSE + CONE VALVE + SPILLWAY

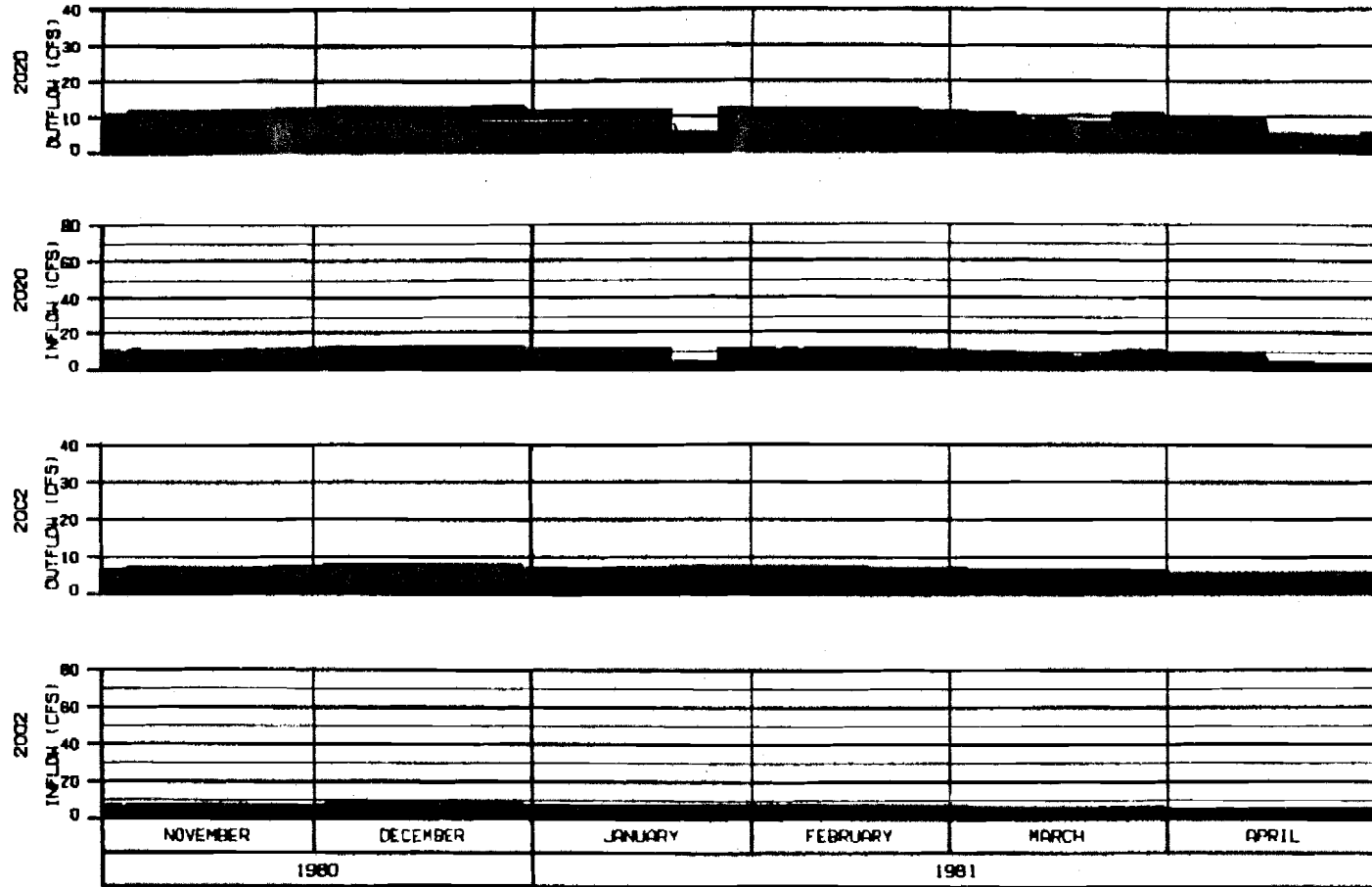
ALASKA POWER AUTHORITY	
SUSITNA PROJECT	DYRESM MODEL
WATANA RESERVOIR INFLOW AND OUTFLOW	
HARZA-EBASCO JOINT VENTURE	
CHICAGO - ILLINOIS	18 JUL 82 42-010-04



LEGEND: **=====** INFLOW **=====**
===== SUSITNA RIVER
----- SUSITNA + TRIBUTARY
===== OUTFLOW **=====**
===== POWERHOUSE
----- POWERHOUSE + CONE VALVE
----- POWERHOUSE + CONE VALVE + SPILLWAY

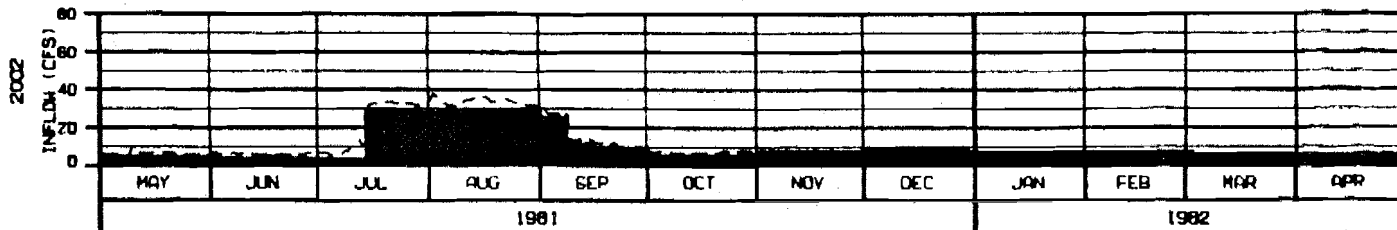
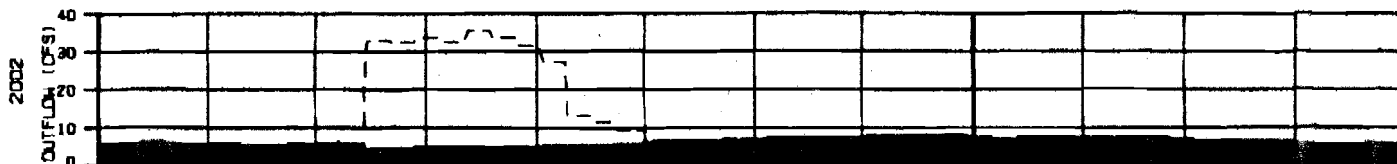
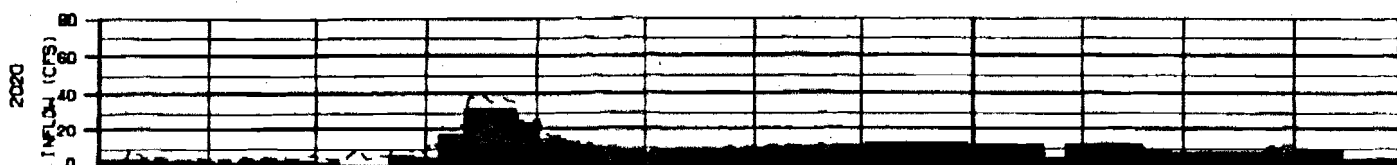
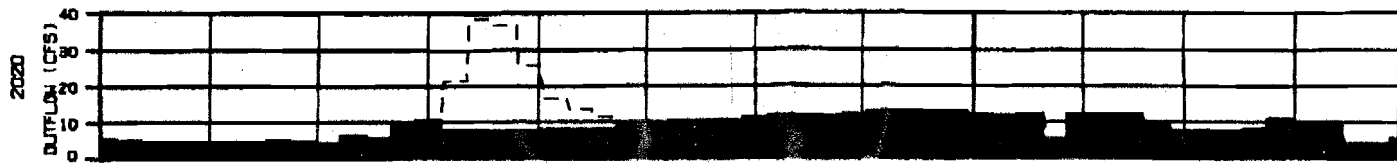
ALASKA POWER AUTHORITY	
SUSITNA PROJECT	HYDRA MODEL
WATANA RESERVOIR INFLOW AND OUTFLOW	
MARZA-EBASCO JOINT VENTURE	
CHICAGO, ILL. 60611	18 JUL 84
	47-910-04

EXHIBIT L



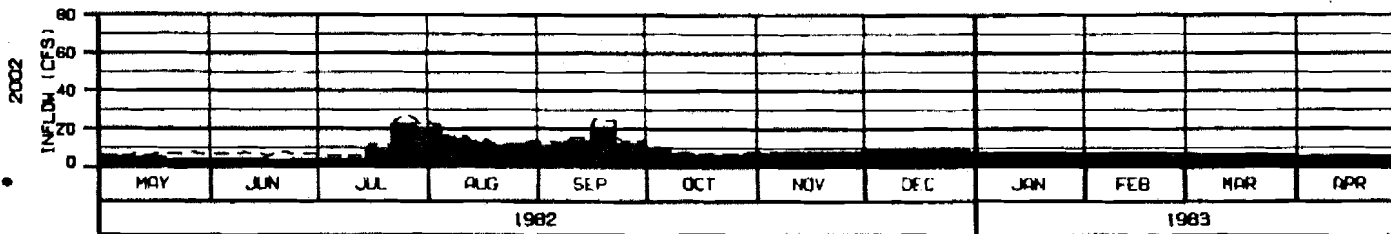
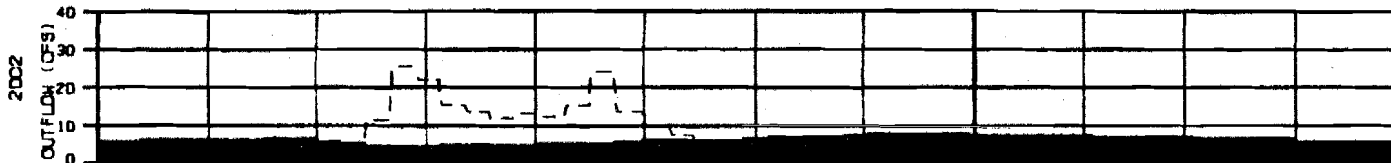
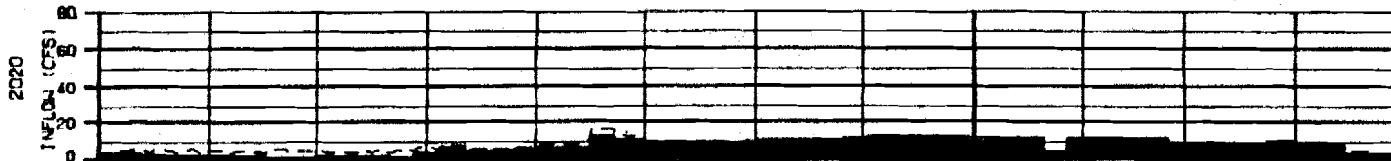
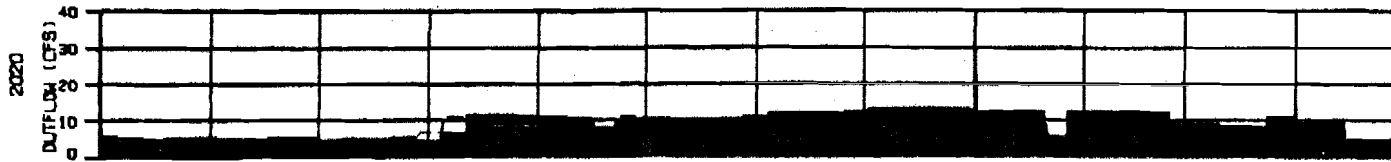
LEGEND: **=====** INFLOW **=====**
===== SUSITNA RIVER (FROM NATANA)
----- SUSITNA + TRIBUTARY
===== OUTFLOW **=====**
===== POWERHOUSE
----- POWERHOUSE + CONE VALVE
----- POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	DYWIDAG MODEL
DEVIL CANYON RESERVOIR INFLOW AND OUTFLOW	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	18 JAN 80
48-010-04	



LEGEND: **=====** INFLOW **=====**
===== SUSITNA RIVER (FROM NATANA)
----- SUSITNA + TRIBUTARY
===== OUTFLOW **=====**
===== POWERHOUSE
----- POWERHOUSE + CONE VALVE
----- POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY		
SUSITNA PROJECT	DYWIDAG MODEL	
DEVIL CANYON RESERVOIR INFLOW AND OUTFLOW		
HARZA-EBASCO JOINT VENTURE		
CHICAGO, ILLINOIS	18 JAN 84	AR-010-04



LEGEND: INFLOW

SUBITNA RIVER (FROM NATANA)

SUBITNA + TRIBUTARY

OUTFLOW

POWERHOUSE

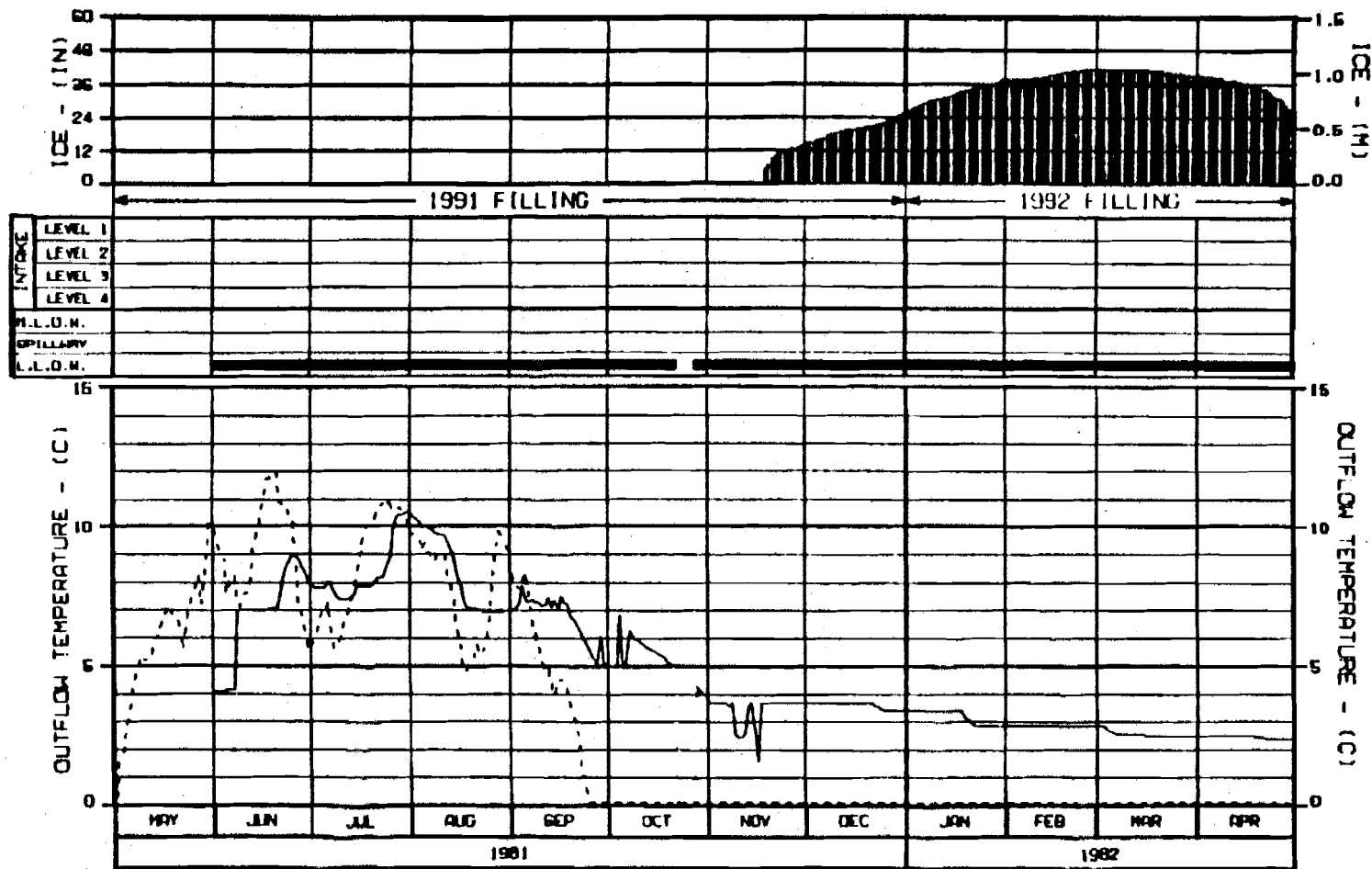
POWERHOUSE + CONE VALVE

POWERHOUSE + CONE VALVE + SPILLWAY

ALASKA POWER AUTHORITY	
SUBITNA PROJECT	DYRSHN MODEL
DEVIL CANYON RESERVOIR INFLOW AND OUTFLOW	
HARZA-EBASCO JOINT VENTURE	
CHICHO, ILLINOIS	18 JUL 84
	48-010-84

Watana Filling

EXHIBIT M



LEGEND: CASE: WATANA WABIFILA - WATANA FILLING OPERATION
 FIRST YEAR FILLING STARTS IN MAY 1991
 ——— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.0 M)
 5. CONE VALVE (LOW) AT ELEVATION 2040 FT (621.0 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)
 7. LOW LEVEL OUTLET WORKS (LOW) ELEV. 1608 FT (490.96 M)

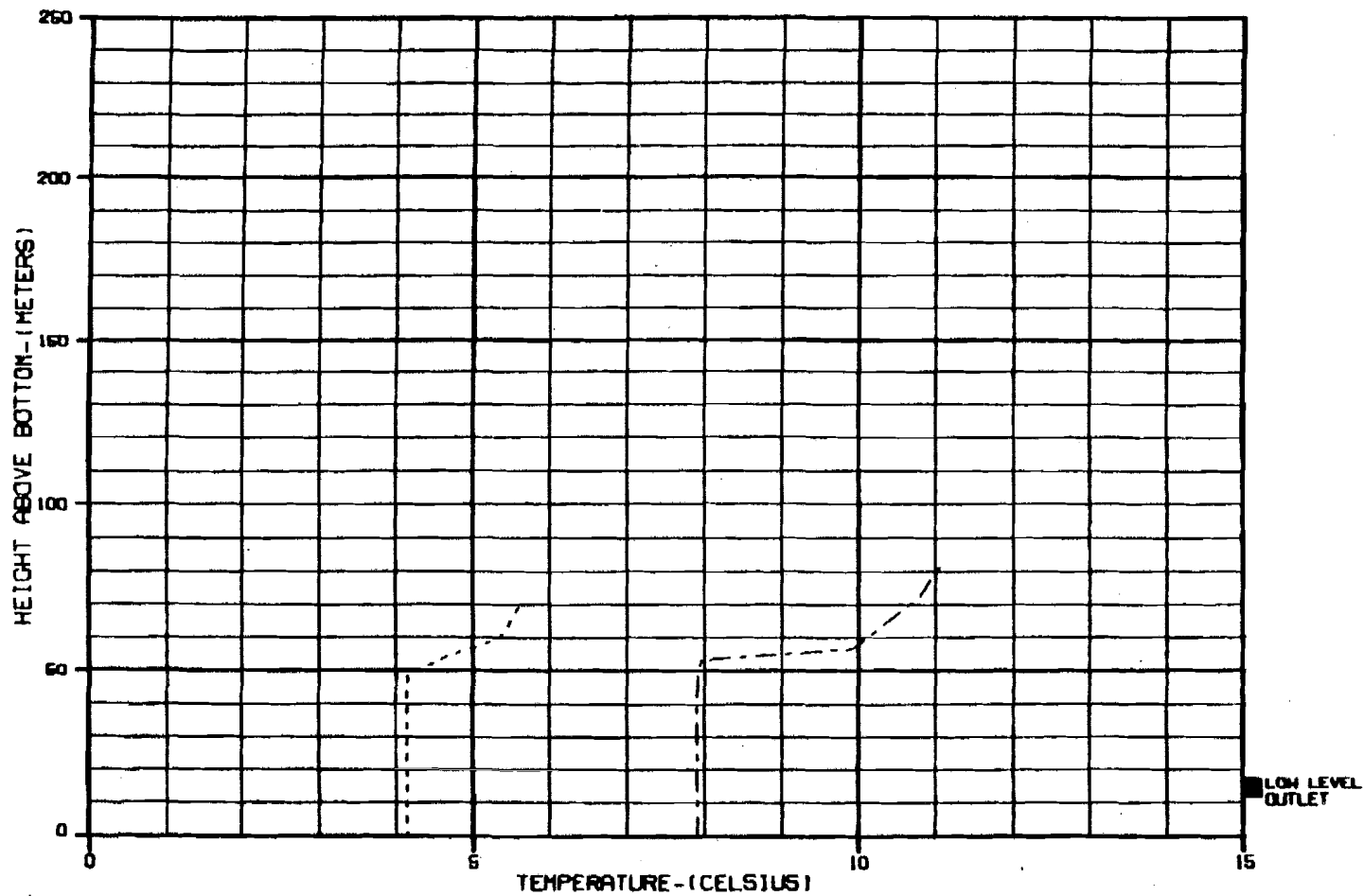
ALASKA POWER AUTHORITY

SUBMITTING PROJECT: WATANA MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

ENGINEER: ALP-1000 7 JUL 91 44-810-01



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 MAY 1981
 - - - - - 1 JUNE 1981
 - · - · - 1 JULY 1981

ALASKA POWER AUTHORITY

WATANA PROJECT

OVERSEAS MODEL

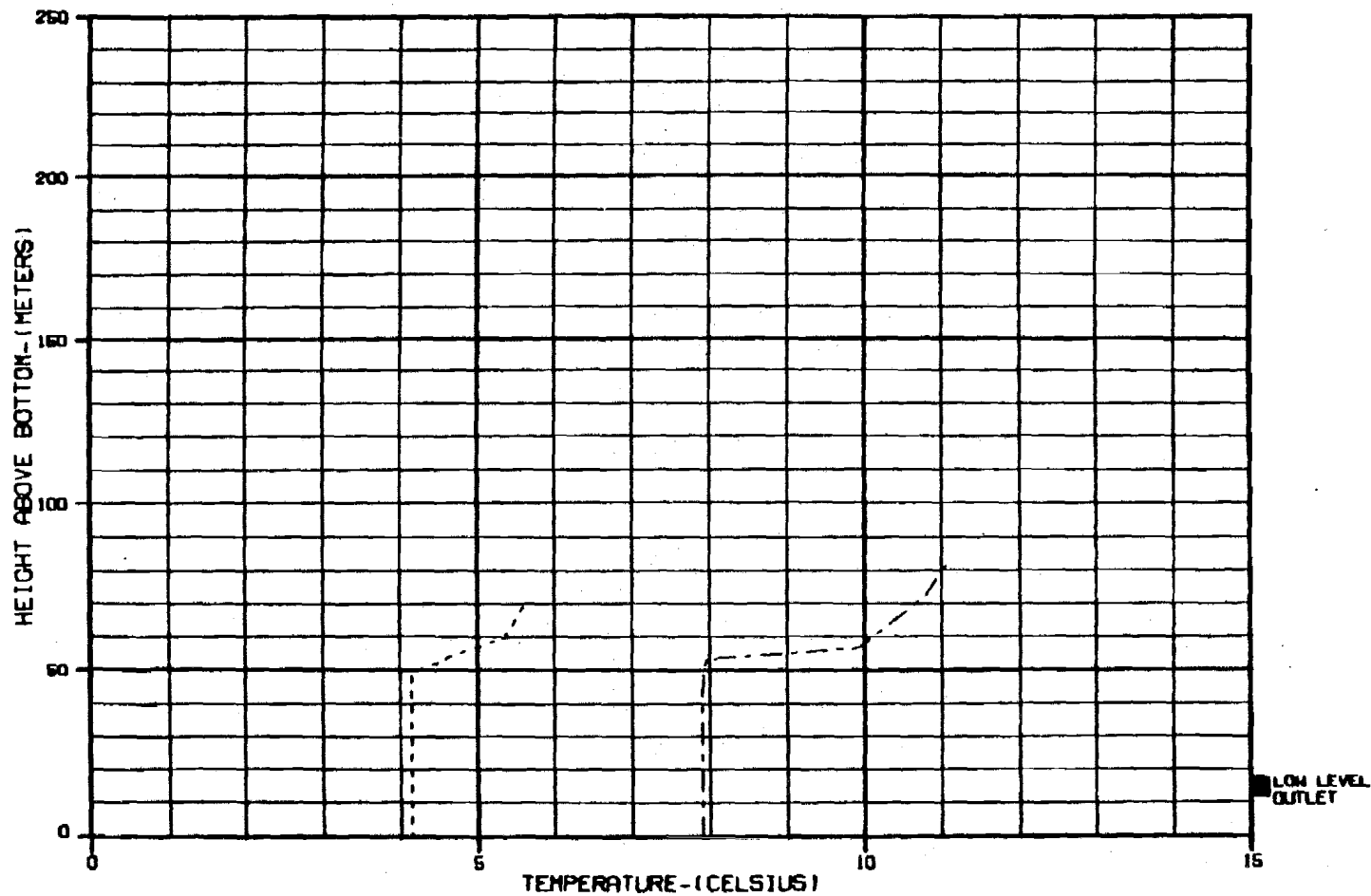
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRACCO JOINT VENTURE

ORDER: AL-1000

1 JAN 81

42-010-04



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | MAY 1981
 - - - - - | JUNE 1981
 - · - · - | JULY 1981

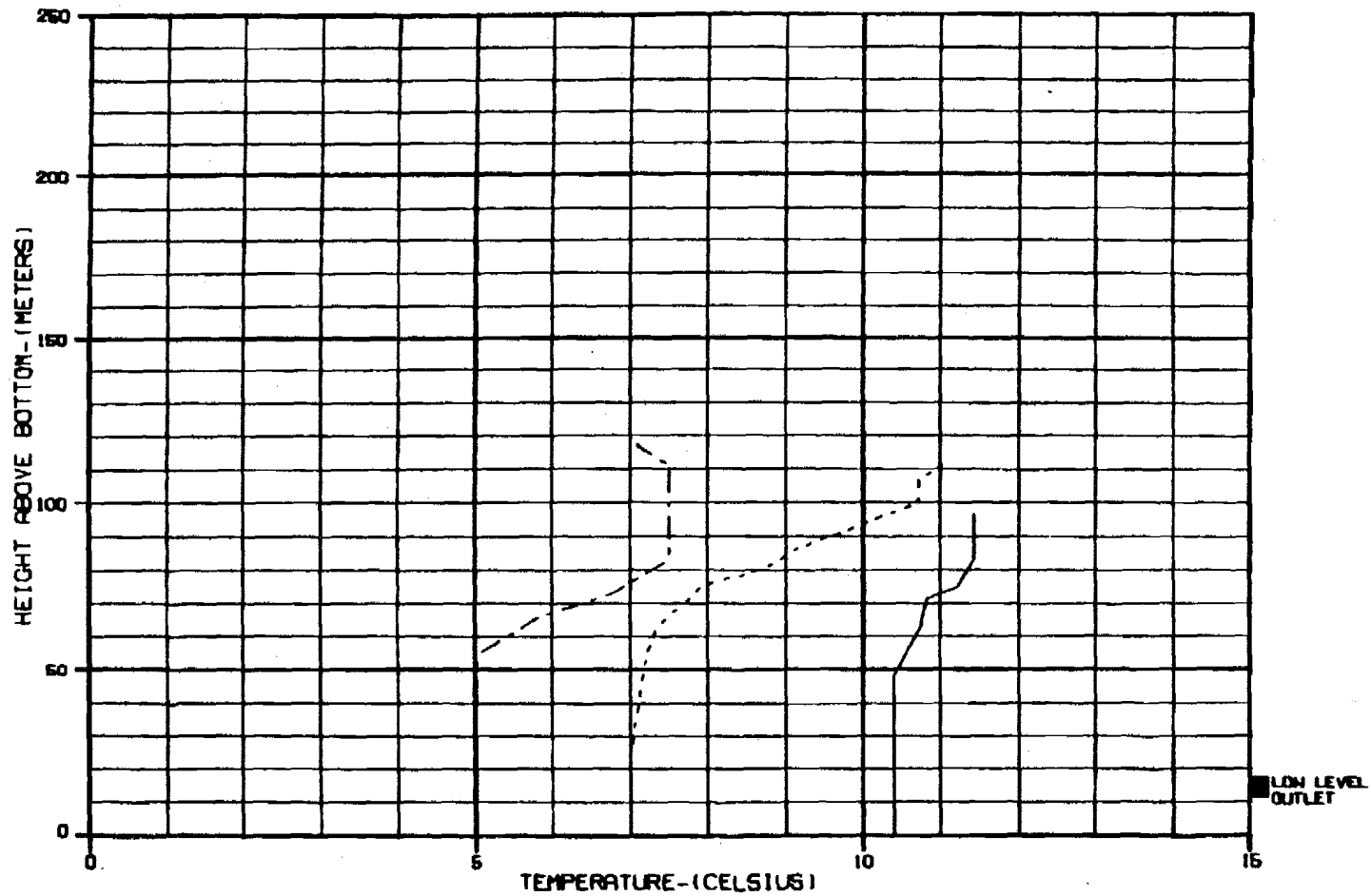
ALASKA POWER AUTHORITY

WATANA PROJECT DYNEM MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGNER: A.L. POPE 1 JAN 84 42-010-04



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | AUGUST 1981
 - - - - - | SEPTEMBER 1981
 - · - · - | OCTOBER 1981

ALASKA POWER AUTHORITY

WATANA PROJECT

STATION MODEL

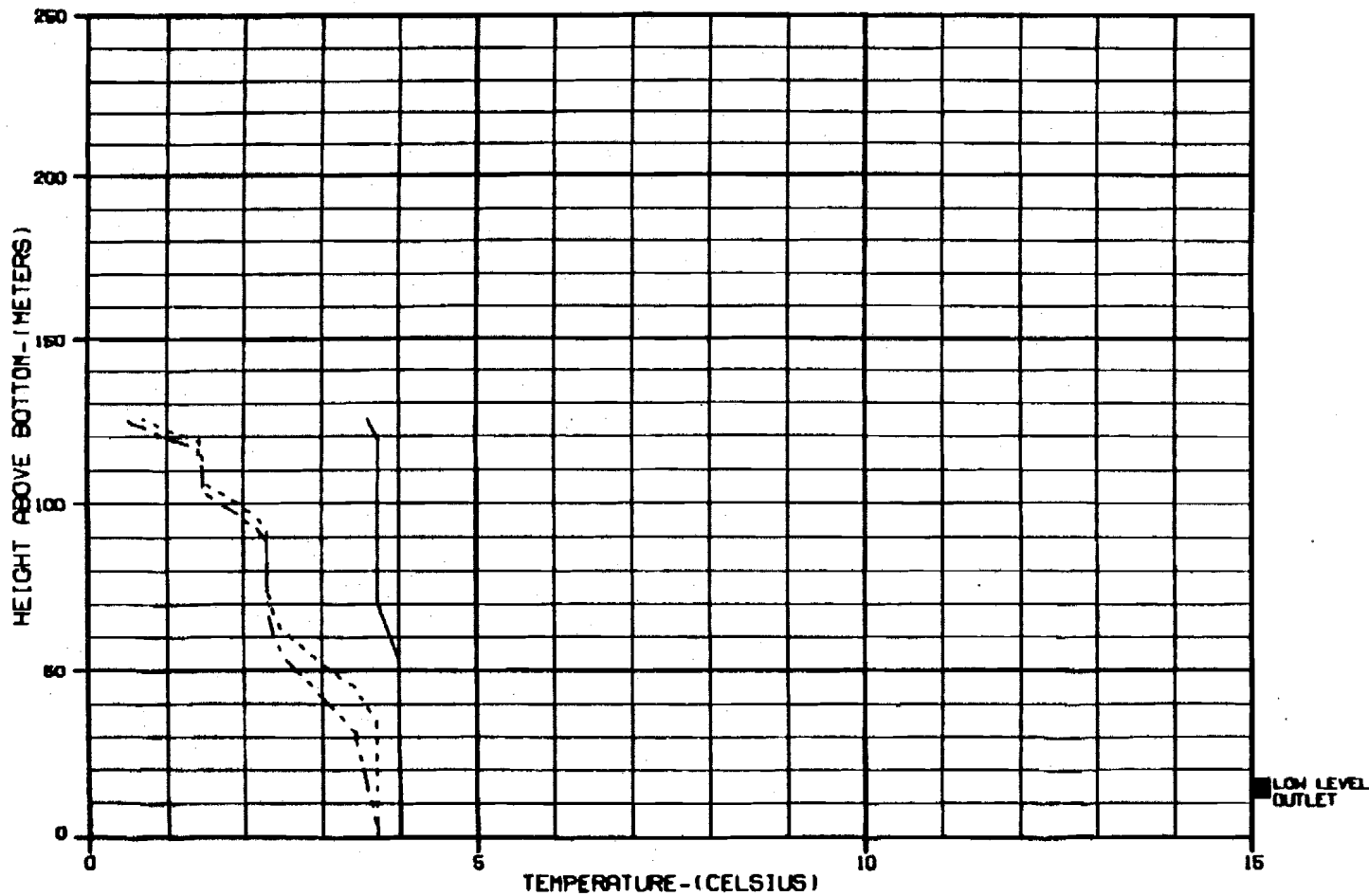
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHAPER. 11.1.1.1

1 JUN 81

42-010-04



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 NOVEMBER 1981
 - - - - - 1 DECEMBER 1981
 - · - · - 1 JANUARY 1982

ALASKA POWER AUTHORITY

SUBITNA PROJECT

OPERATION MODEL

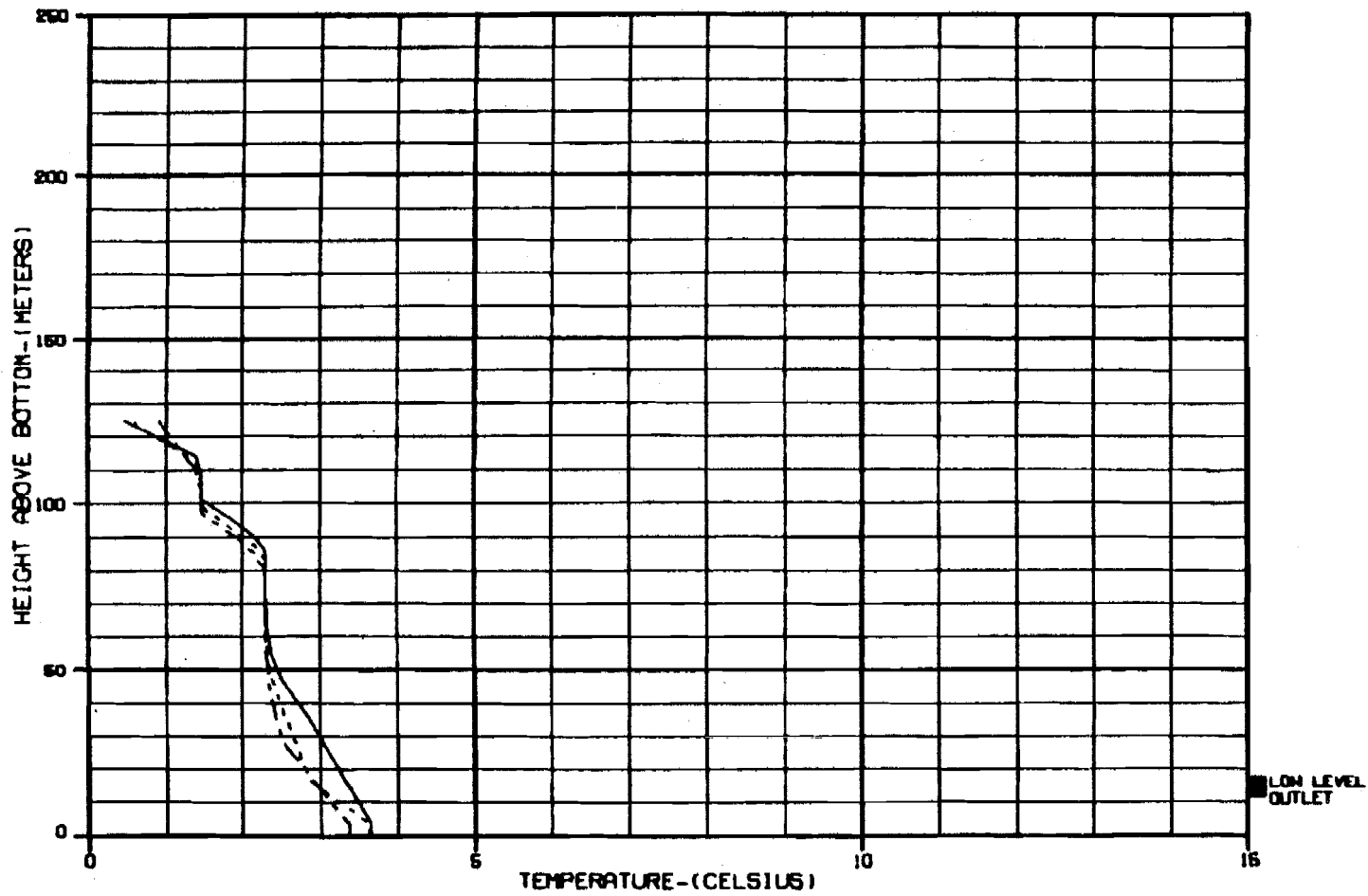
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHIEF: B.L. POND

4 JAN 82

42-010-04



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | FEBRUARY 1982
- | MARCH 1982
- - - - - | APRIL 1982

ALASKA POWER AUTHORITY

SUBITMA PROJECT

DYNAMIC MODEL

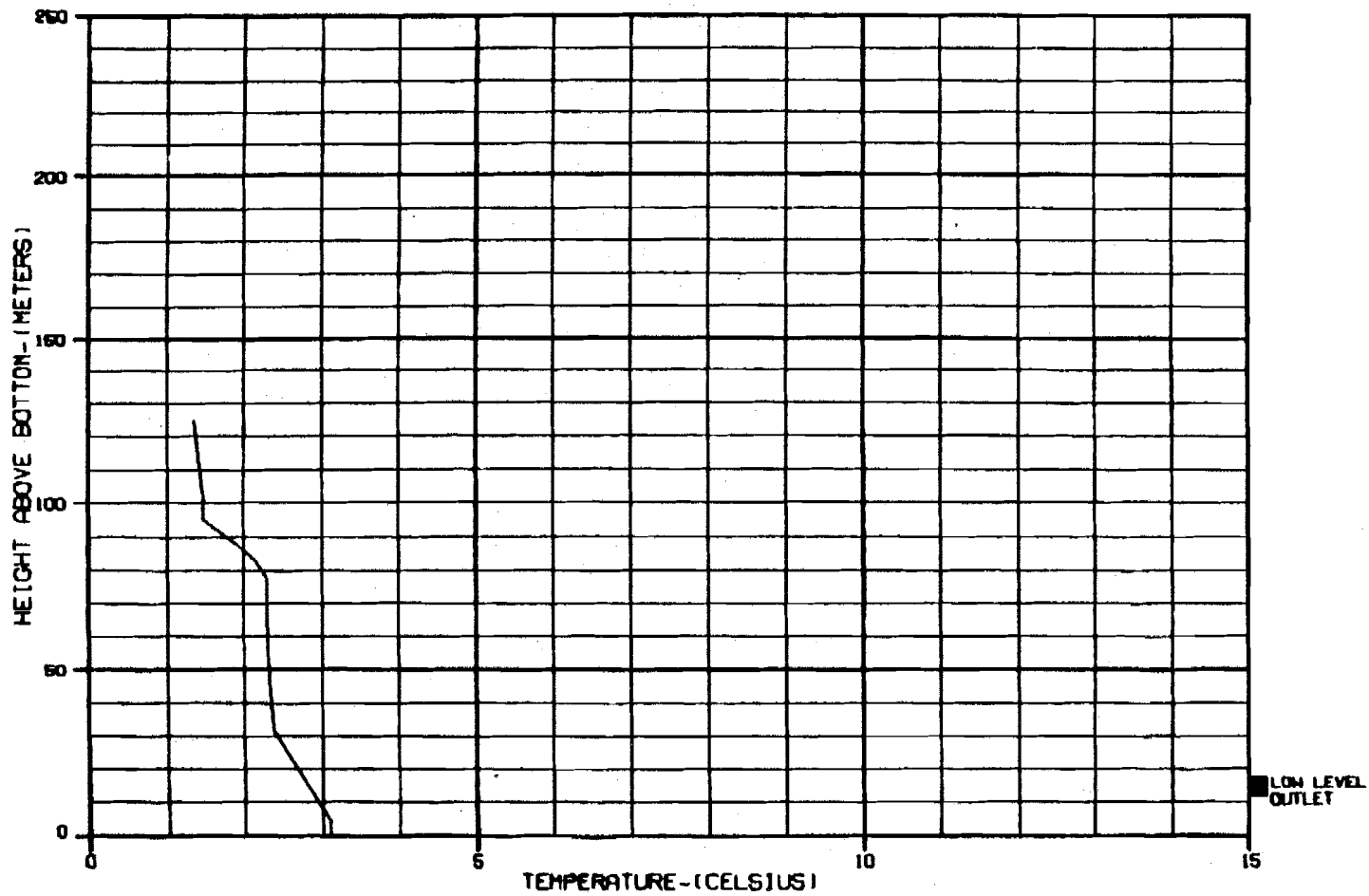
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGNER - S.L. PATE

4 JAN 84

42-010-04



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | MAY 1982
 - - - - - | JUNE 1982
 - · - · - | JULY 1982

ALASKA POWER AUTHORITY

WATANA PROJECT

DYNOSH MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

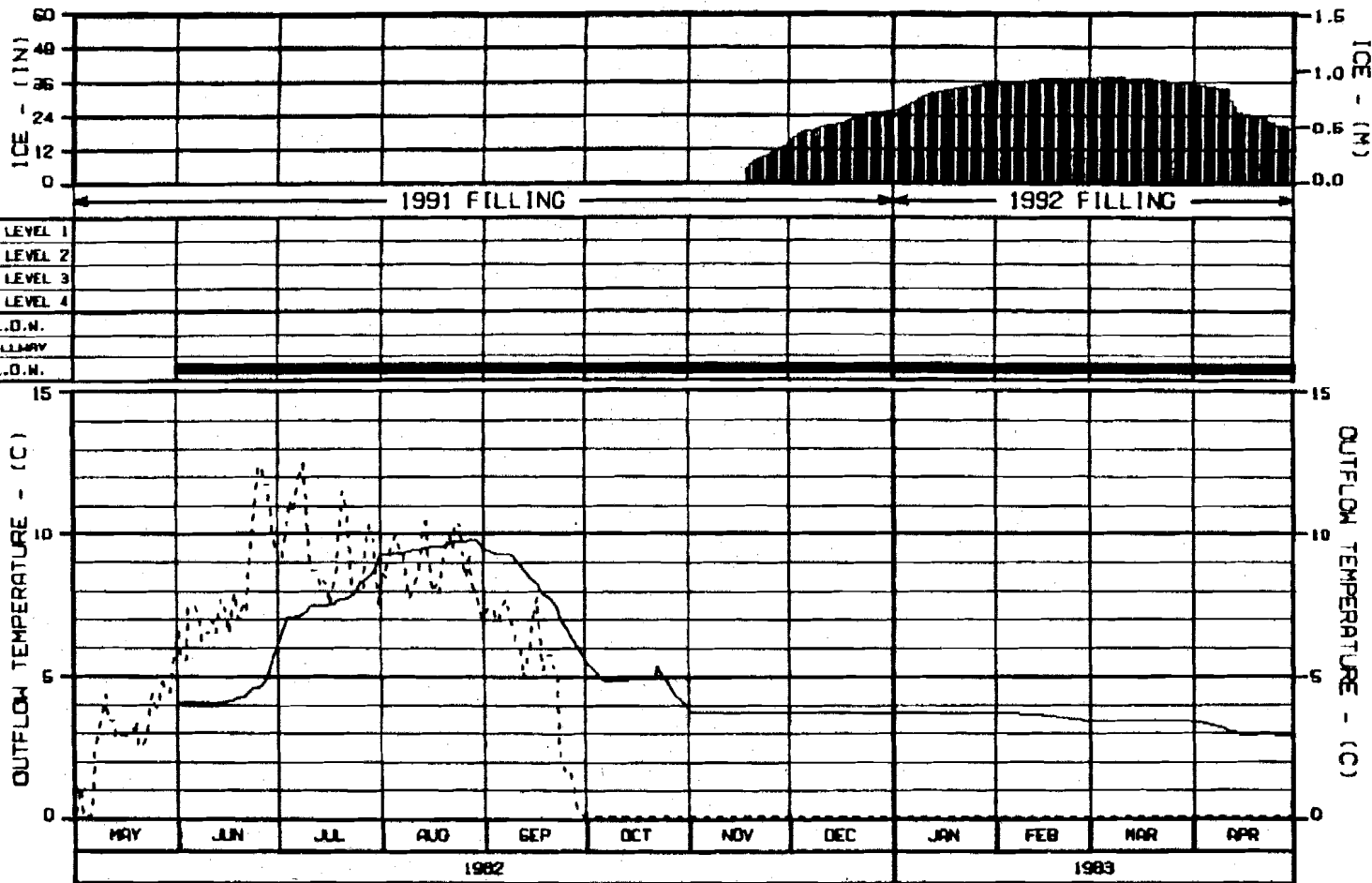
HARZA-EBASCO JOINT VENTURE

ENGINE - (L.P. 107)

4 JAN 83

42-010-04

EXHIBIT N

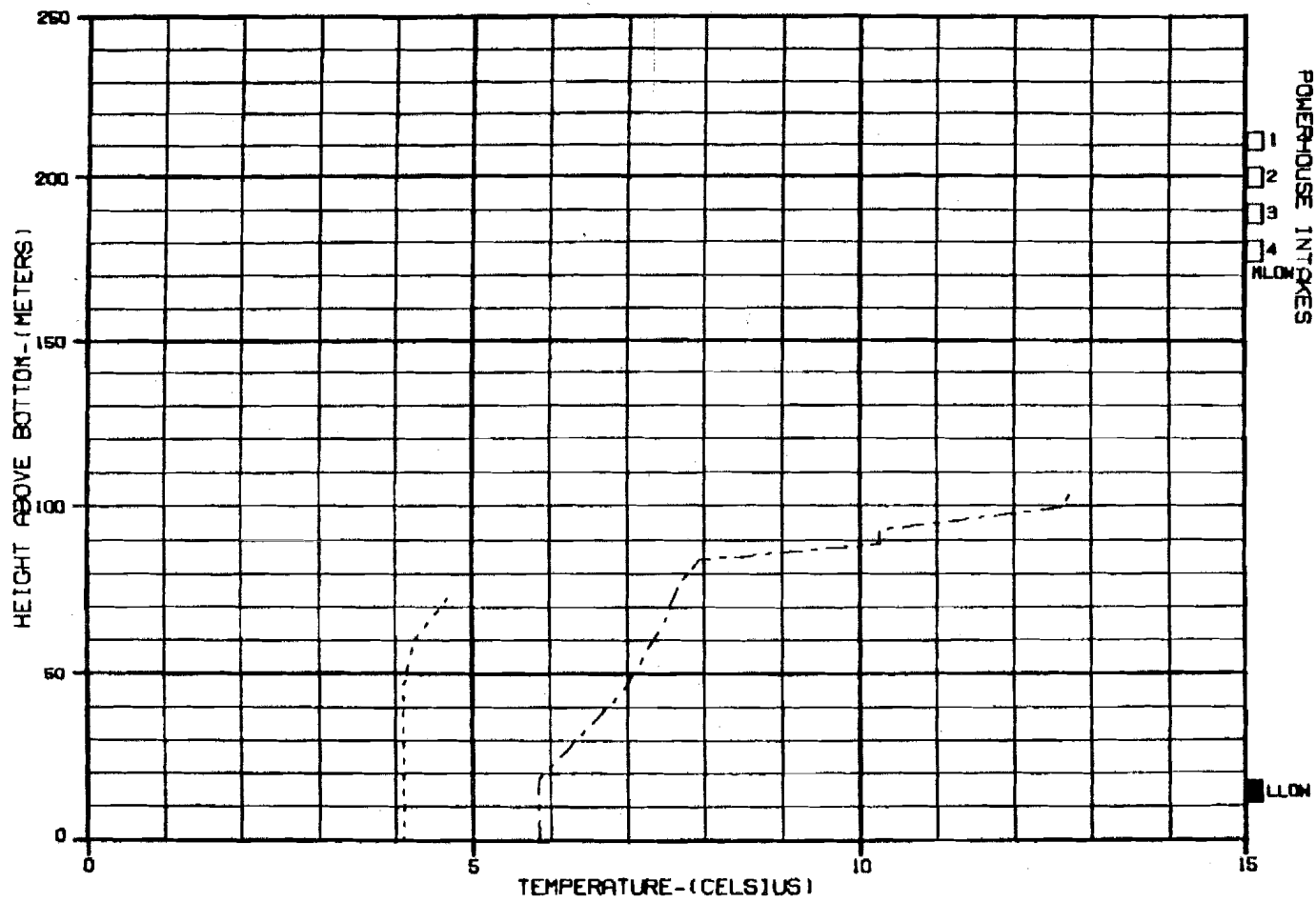


LEGEND: CASE: WATANA FILLING OPERATION
 FIRST YEAR FILLING STARTS IN MAY 1992
 ——— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2151 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.0 M)
 5. CONE VALVE (HLOW) AT ELEVATION 2040 FT (621.0 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)
 7. LOW LEVEL OUTLET WORKS (HLOW) ELEV. 1509 FT (459.96 M)

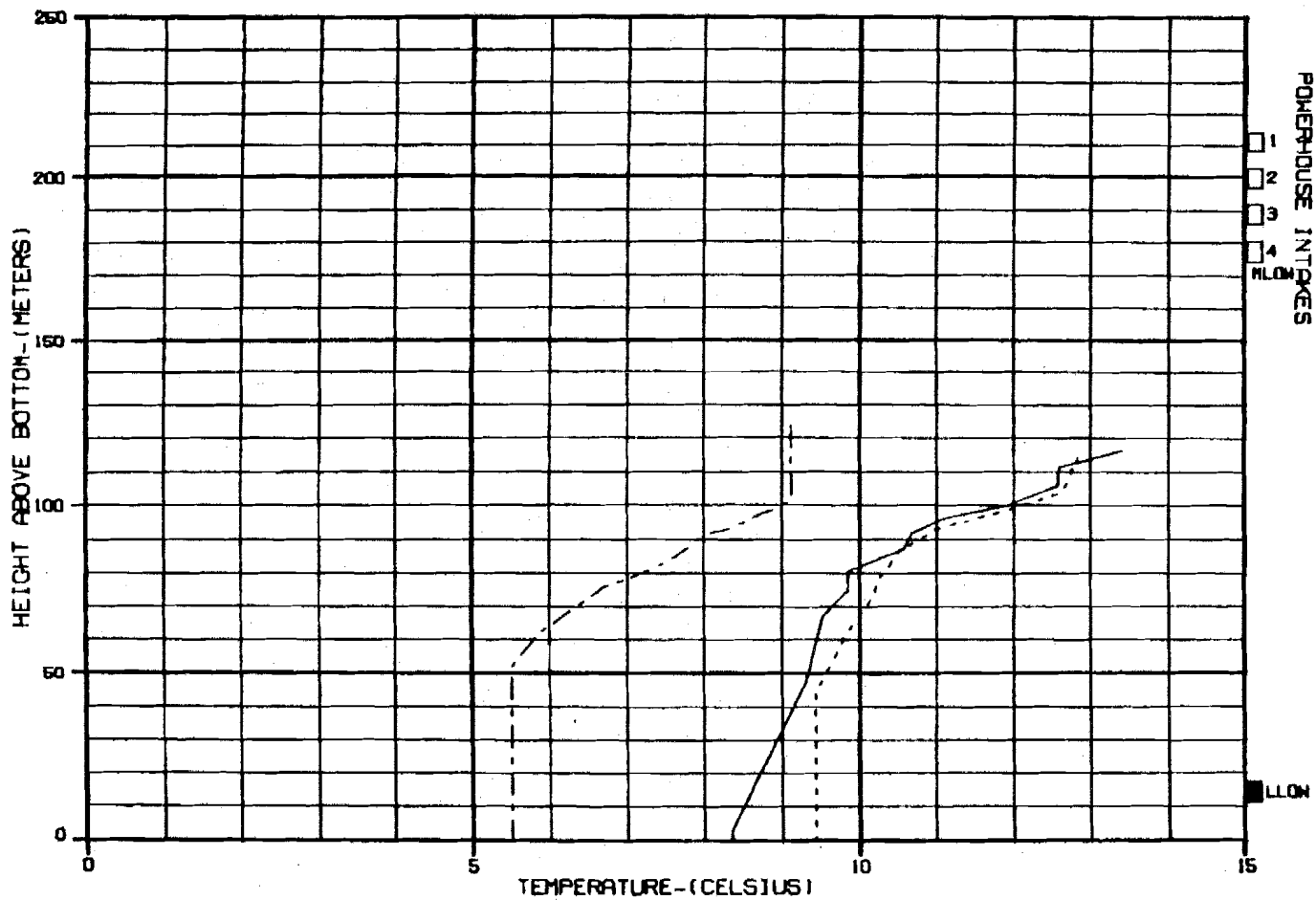
ALASKA POWER AUTHORITY

SUBITNA PROJECT	OPERON MODEL
WATANA RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH	
HARZA-EBASCO JOINT VENTURE	
CHICHO. 84-0005 07 JUN 84	48-010-04



CASE: ■ WAB11821FILF - WATANA RESERVOIR FILLING ■
 - FIRST YEAR FILLING STARTING IN MAY 1982
 RESERVOIR ELEV. ALLOWS LOW-LEVEL OPERATION ONLY
 LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 MAY 1982
 - - - - - 1 JUNE 1982
 - · - · - 1 JULY 1982

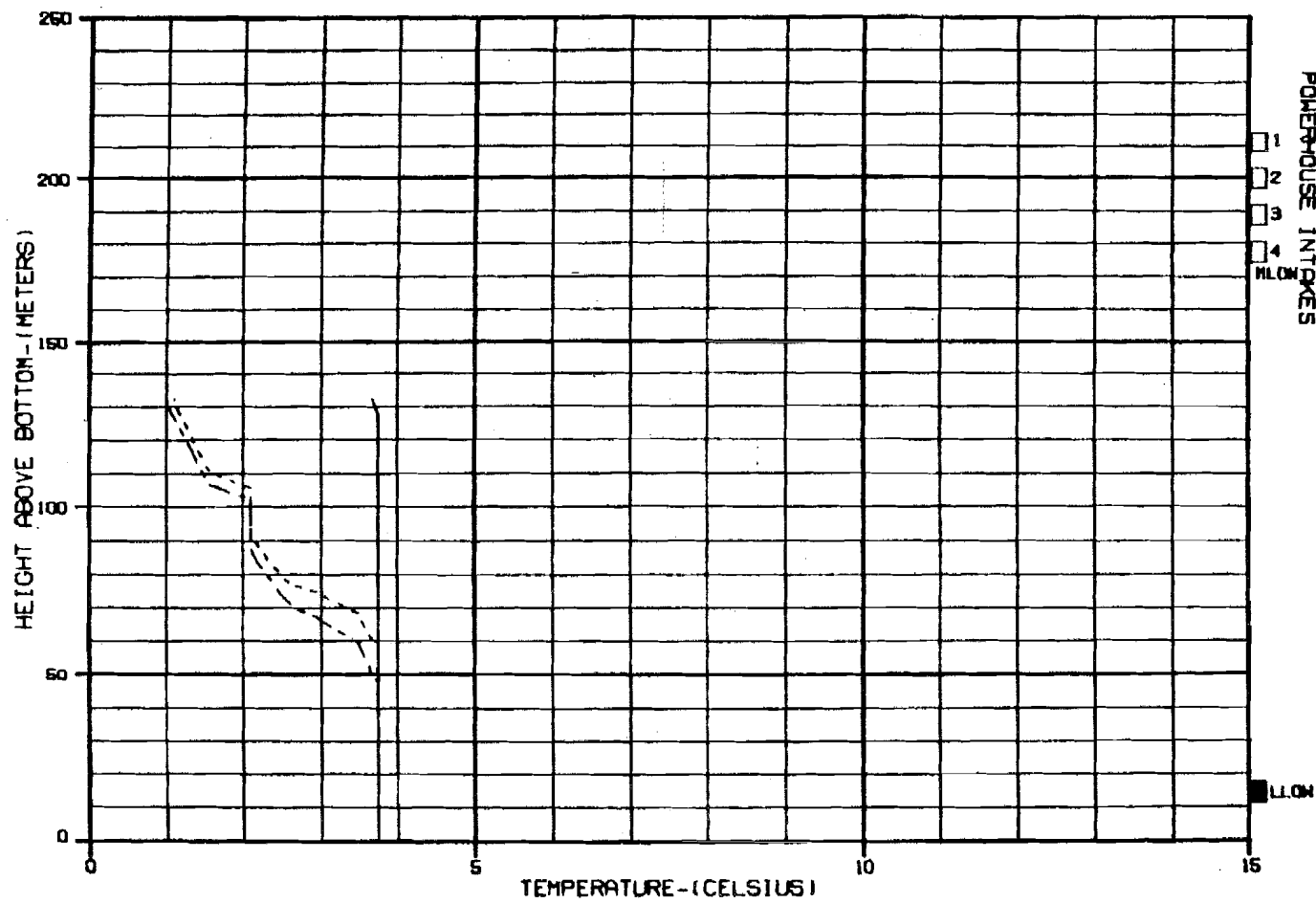
ALASKA POWER AUTHORITY	
SUBTNA PROJECT	OPERBN MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
CHGCRS. 01.18.82 BY JAM BK	4E-010-04



CASE: WAB1(82)FILF - WATANA RESERVOIR FILLING
 - FIRST YEAR FILLING STARTING IN MAY 1982
 RESERVOIR ELEV. ALLOWS LOW-LEVEL OPERATION ONLY

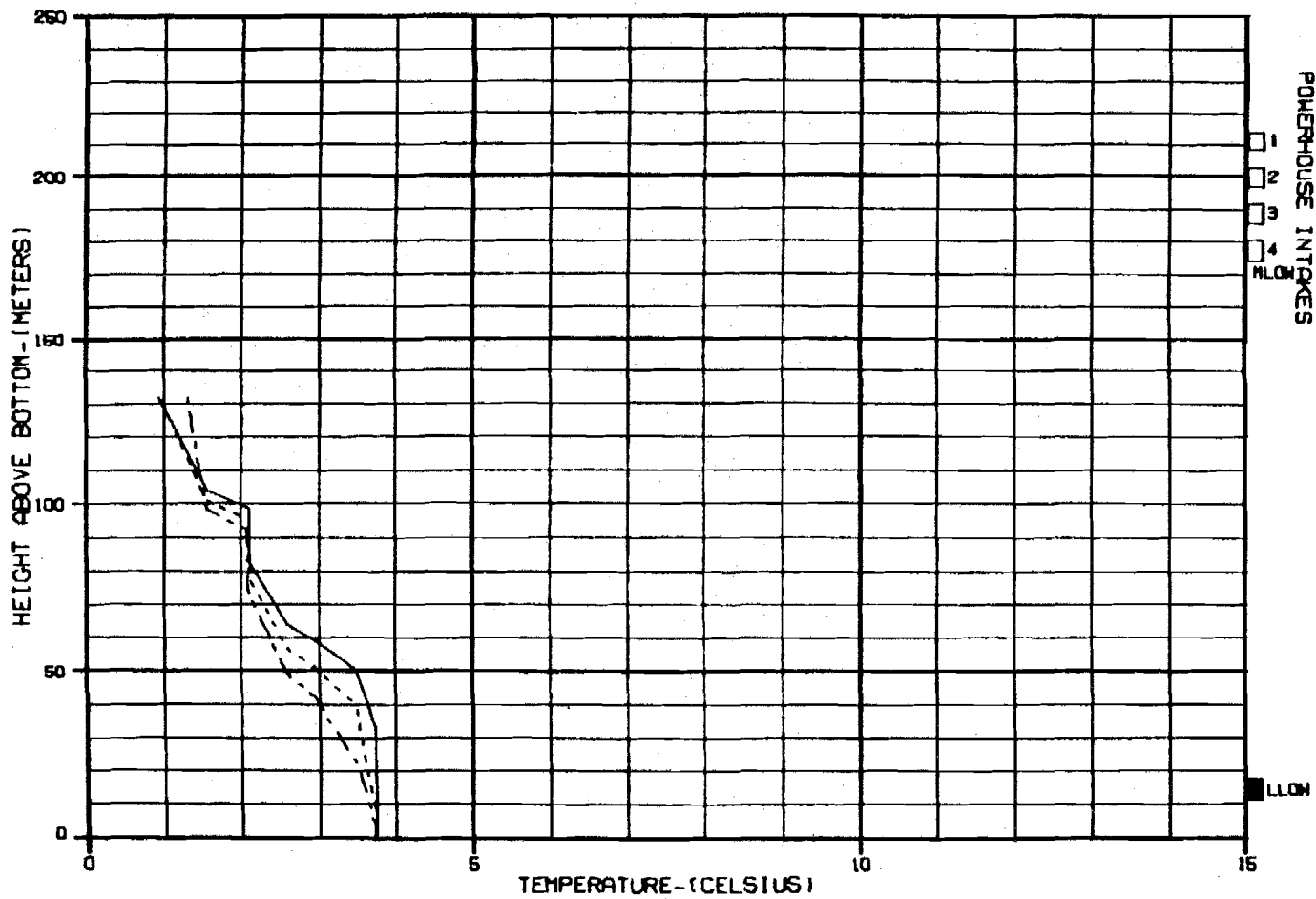
LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ 1 AUGUST 1982
 - - - - - 1 SEPTEMBER 1982
 - . - . - 1 OCTOBER 1982

ALASKA POWER AUTHORITY	
SUBITNA PROJECT	DYRESN MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
DATE: 01-19-82 BY: JAM/SM	REV: 01-01-84



CASE: WAB11821FILF - WATANA RESERVOIR FILLING
 - FIRST YEAR FILLING STARTING IN MAY 1982
 RESERVOIR ELEV. ALLOWS LOW-LEVEL OPERATION ONLY
 LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ 1 NOVEMBER 1982
 - - - - - 1 DECEMBER 1982
 - . - . - 1 JANUARY 1983

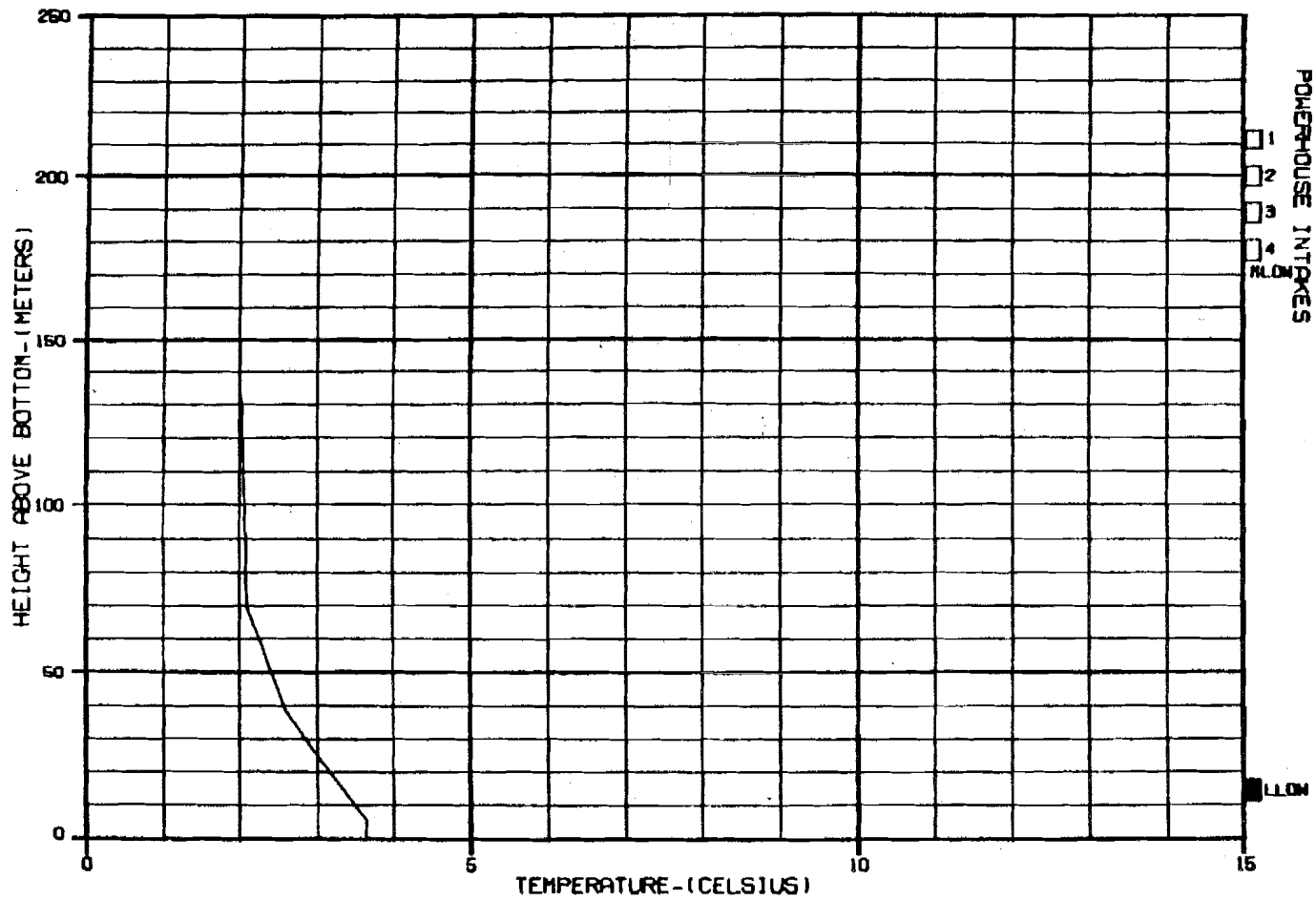
ALASKA POWER AUTHORITY		
SHITNA PROJECT	DYREEM MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
CHGCRG. 11.0810	27 JUN 83	42-010-04



CASE: WAB1182)FILE - WATANA RESERVOIR FILLING
 - FIRST YEAR FILLING STARTING IN MAY 1982
 RESERVOIR ELEV. ALLOWS LOW-LEVEL OPERATION ONLY

LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ 1 FEBRUARY 1983
 1 MARCH 1983
 - - - - - 1 APRIL 1983

ALASKA POWER AUTHORITY	
SUBSTRA PROJECT	DYRESIN MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
CHGCR. ALL DATE	BY JJA 84
4E-010-04	

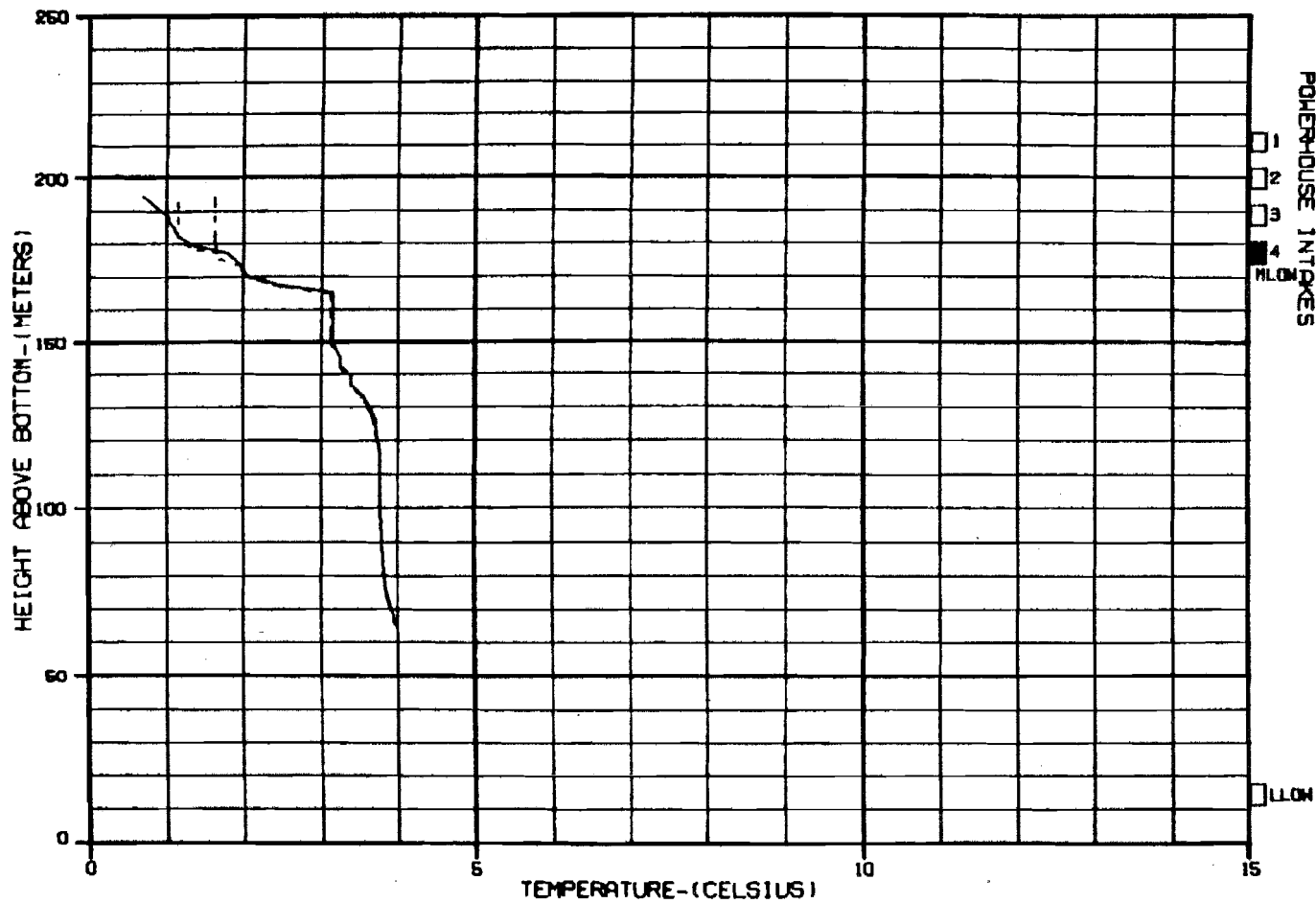


CASE: WAB1182)FILF - WATANA RESERVOIR FILLING
 - FIRST YEAR FILLING STARTING IN MAY 1982
 RESERVOIR ELEV. ALLOWS LOW-LEVEL OPERATION ONLY

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ 1 MAY 1983
 - - - - - 1 JUNE 1983

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	DYPHON MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
DATE: 11/19/82	BY: JLN/84	42-010-04

EXHIBIT O



CASE: WAB11821FILE - WATANA RESERVOIR FILLING WAB
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ 1 FEBRUARY 1982
 - - - - - 1 MARCH 1982
 - . - . - 1 APRIL 1982

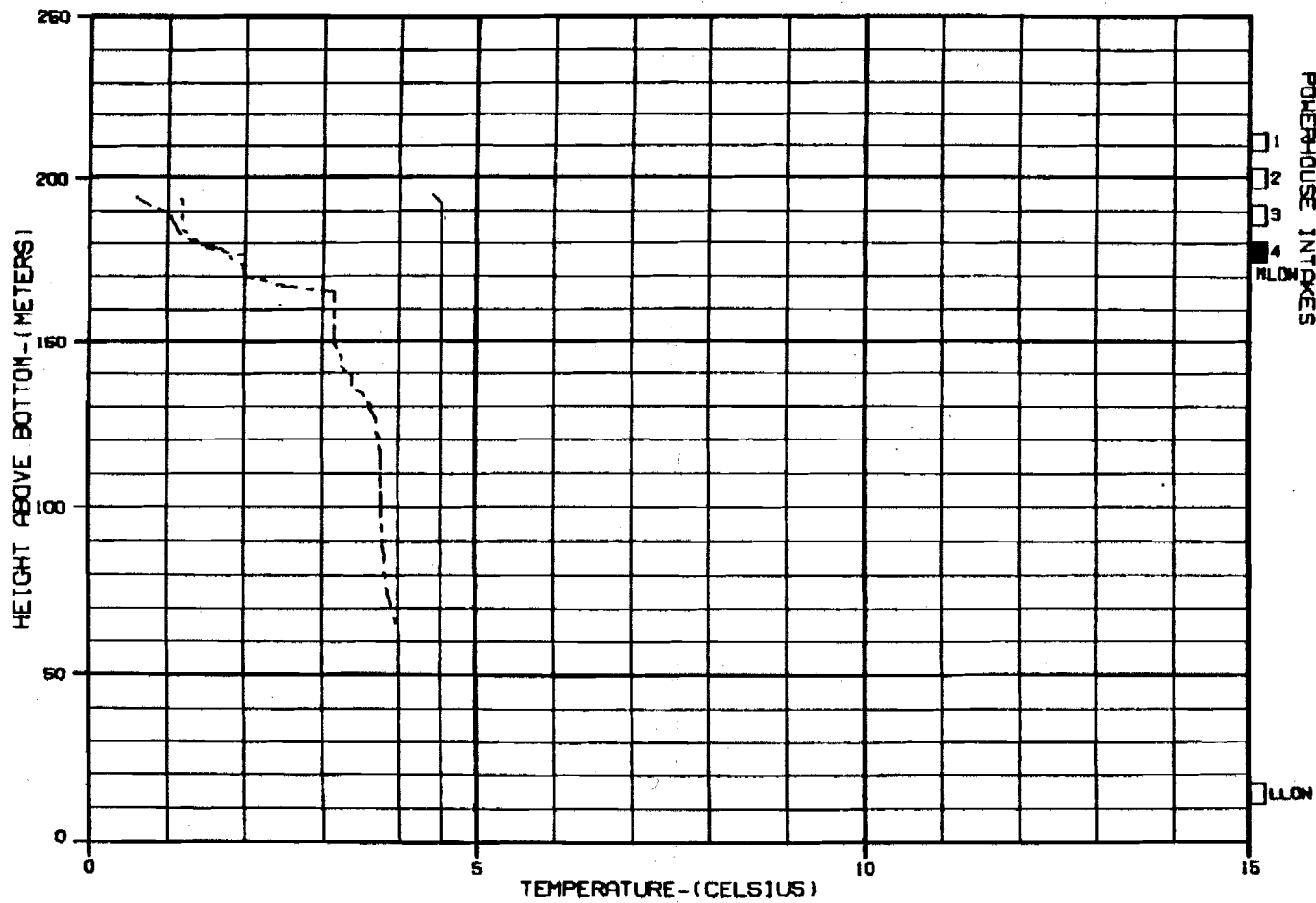
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DYRESM MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBAGCO JOINT VENTURE

CHANGED: ILLINOIS 28 JAN 84 42-010-04



CASE: ** WAB11821FILE - WATANA RESERVOIR FILLING **
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ 1 NOVEMBER 1981
 - - - - - 1 DECEMBER 1981
 1 JANUARY 1982

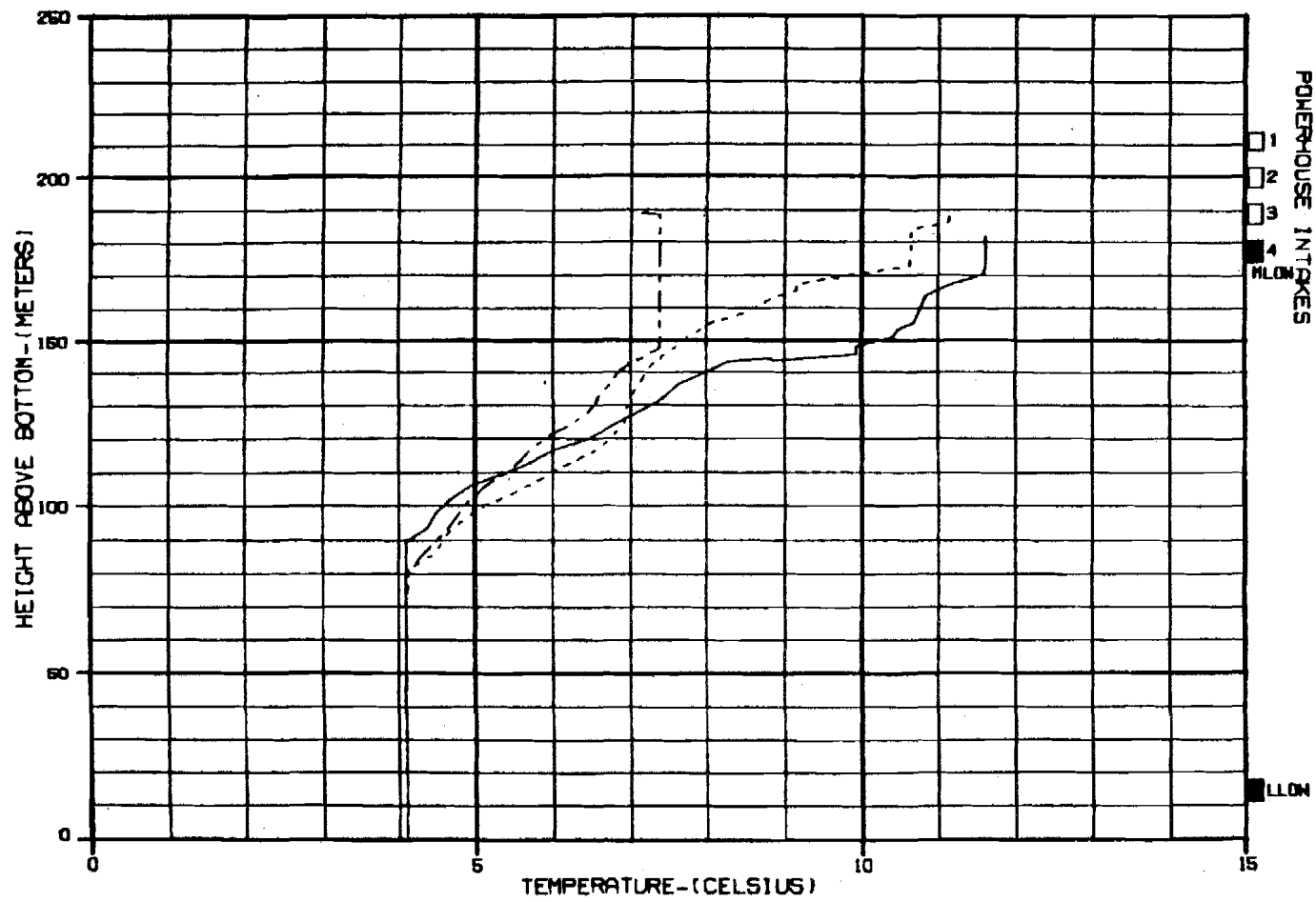
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DYNESM MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBAGCO JOINT VENTURE

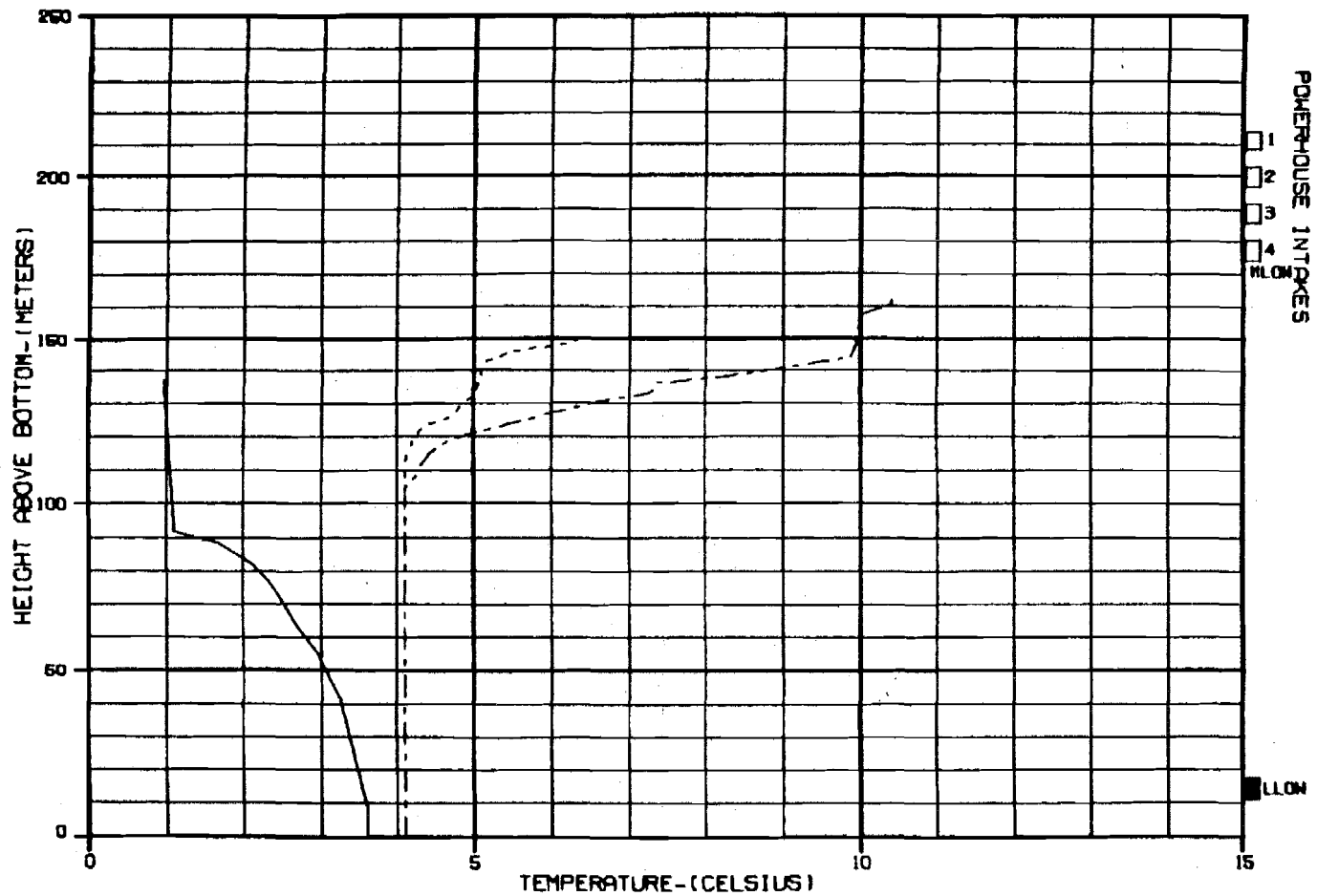
CHANGES: 01/28/82 42-010-04



CASE: *** WAB11821FILE - WATANA RESERVOIR FILLING ***
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)

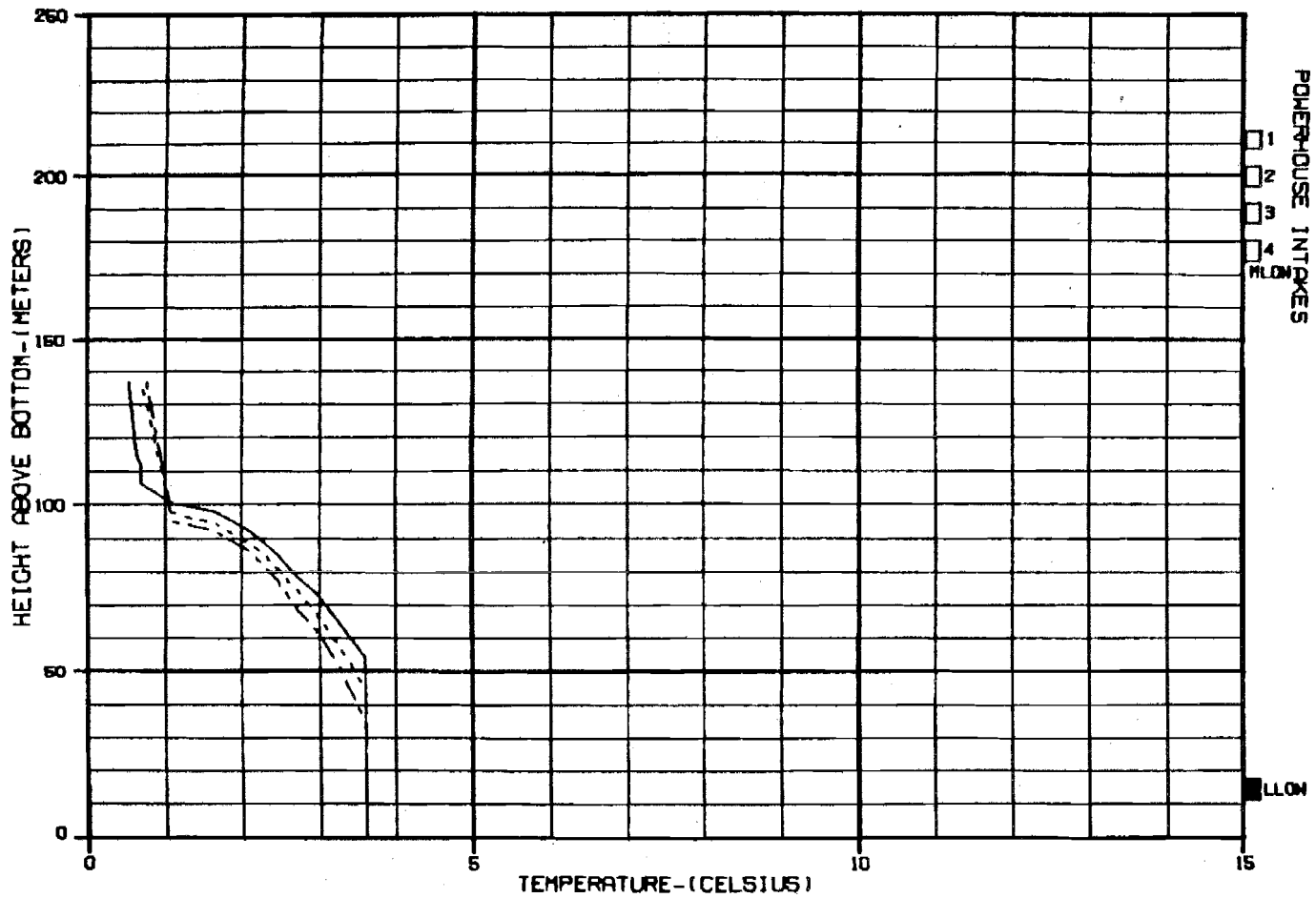
LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ | AUGUST 1981
 - - - - - | SEPTEMBER 1981
 - . - . - | OCTOBER 1981

ALASKA POWER AUTHORITY	
SUBTINA PROJECT	GYREEM MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
DATE: 11/18/81	42-010-04



CASE: WAB11821FILE - WATANA RESERVOIR FILLING
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)
 LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ 1 MAY 1981
 - - - - - 1 JUNE 1981
 - . - . - 1 JULY 1981

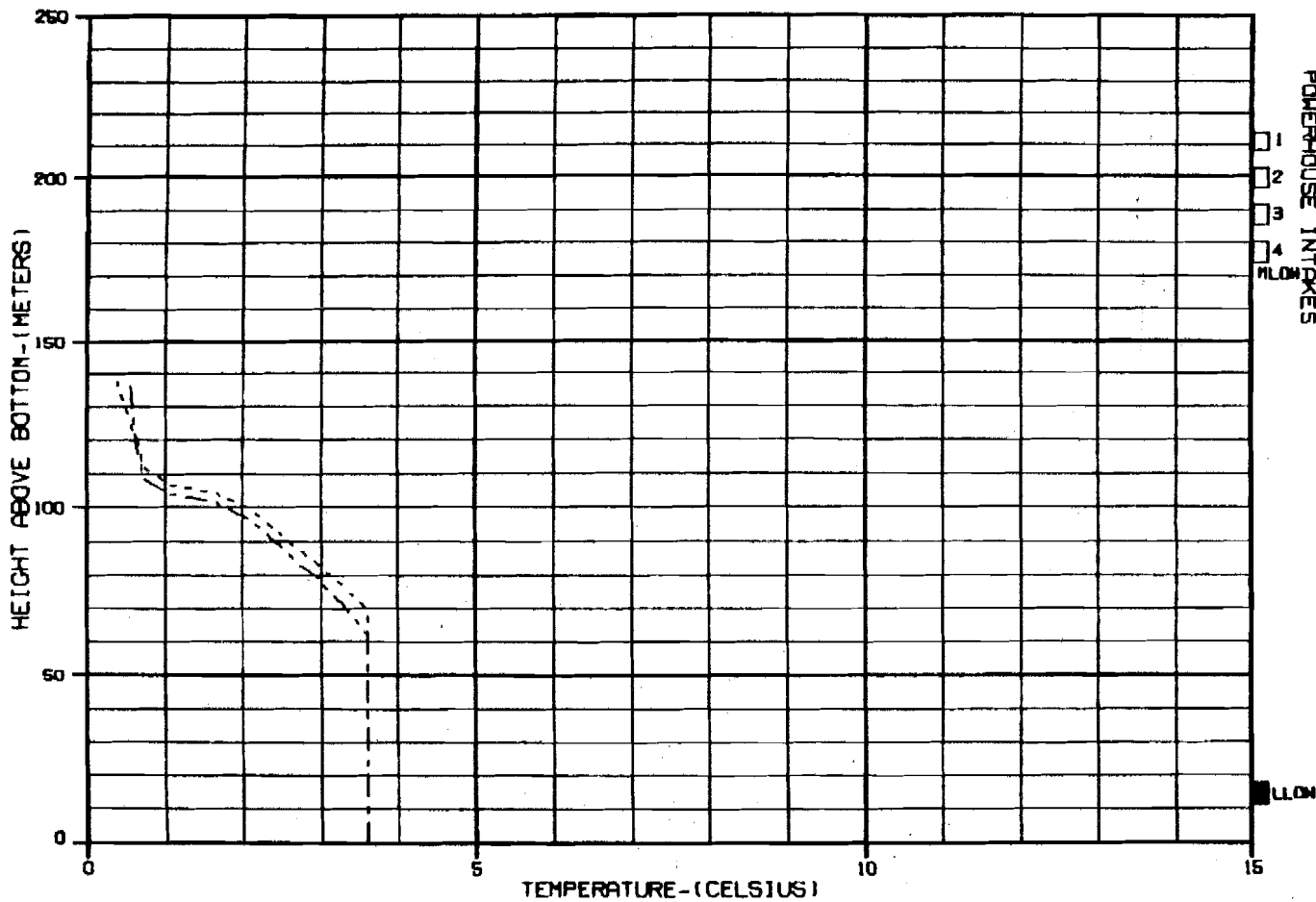
ALASKA POWER AUTHORITY		
GUSTINA PROJECT	DYREEM MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
CHECKED: D.L. 8/81	28 JAN 84	42-010-04



CASE: WAB11821FILE - WATANA RESERVOIR FILLING
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)

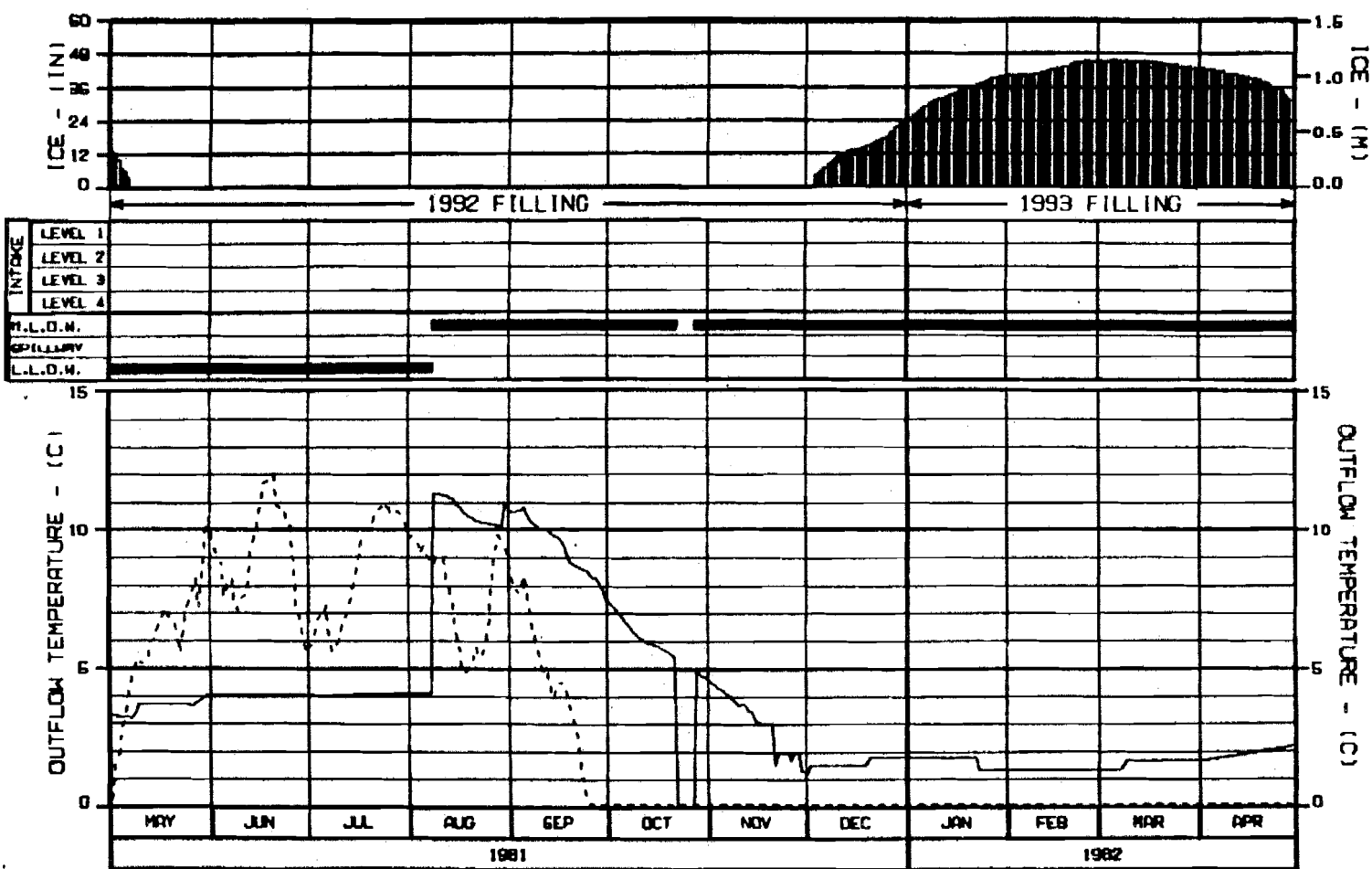
LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ 1 FEBRUARY 1981
 1 MARCH 1981
 - - - - - 1 APRIL 1981

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	DYWIDOR MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
DESIGNED BY: B.L.P. 8/81	DATE: 28 JAN 81	REV: 02-010-04



CASE: ■■ WAB11821FILE - WATANA RESERVOIR FILLING ■■
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)
 LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ 1 NOVEMBER 1980
 - - - - - 1 DECEMBER 1980
 - · - · - 1 JANUARY 1981

ALASKA POWER AUTHORITY	
SUBITMA PROJECT	OPENSH MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
ENCLOS. 11.0-018	28 JAN 81 42-010-04



LEGEND: CASE: ■■■■■ HABIFILE - WATANA FILLING OPERATION ■■■■■
 ■■■■■ LLON OPERATION UNTIL RESERVOIR LEVEL ALLOWS FLOW OPERATION
 ——— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (658.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE (INLOW) AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)
 7. LOW LEVEL OUTLET WORKS (LLOW) ELEV. 1609 FT (490.95 M)

ALASKA POWER AUTHORITY

DESIGN PROJECT DESIGN MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

CHECKED: D.L.D. 26 JUN 84 48-010-00

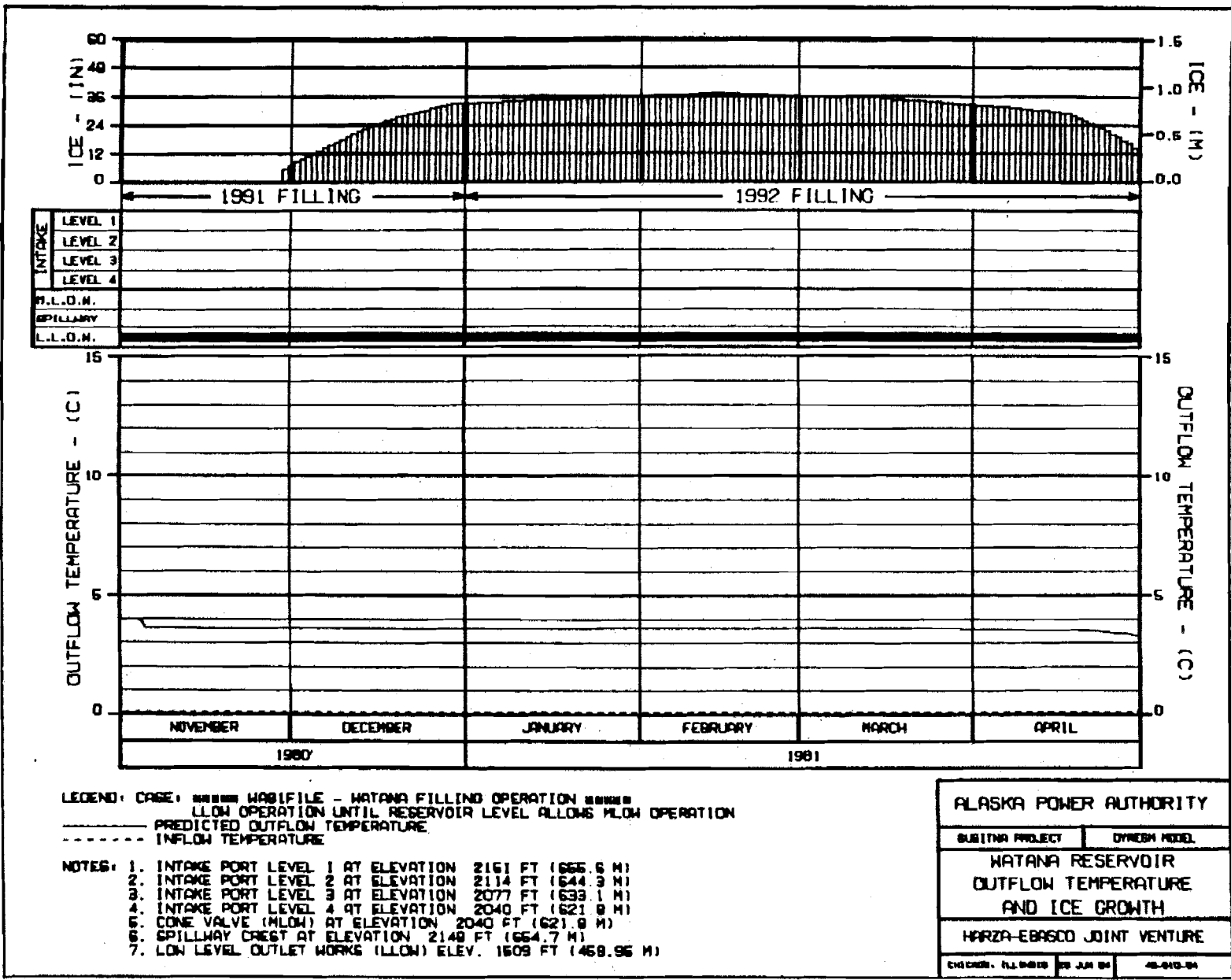
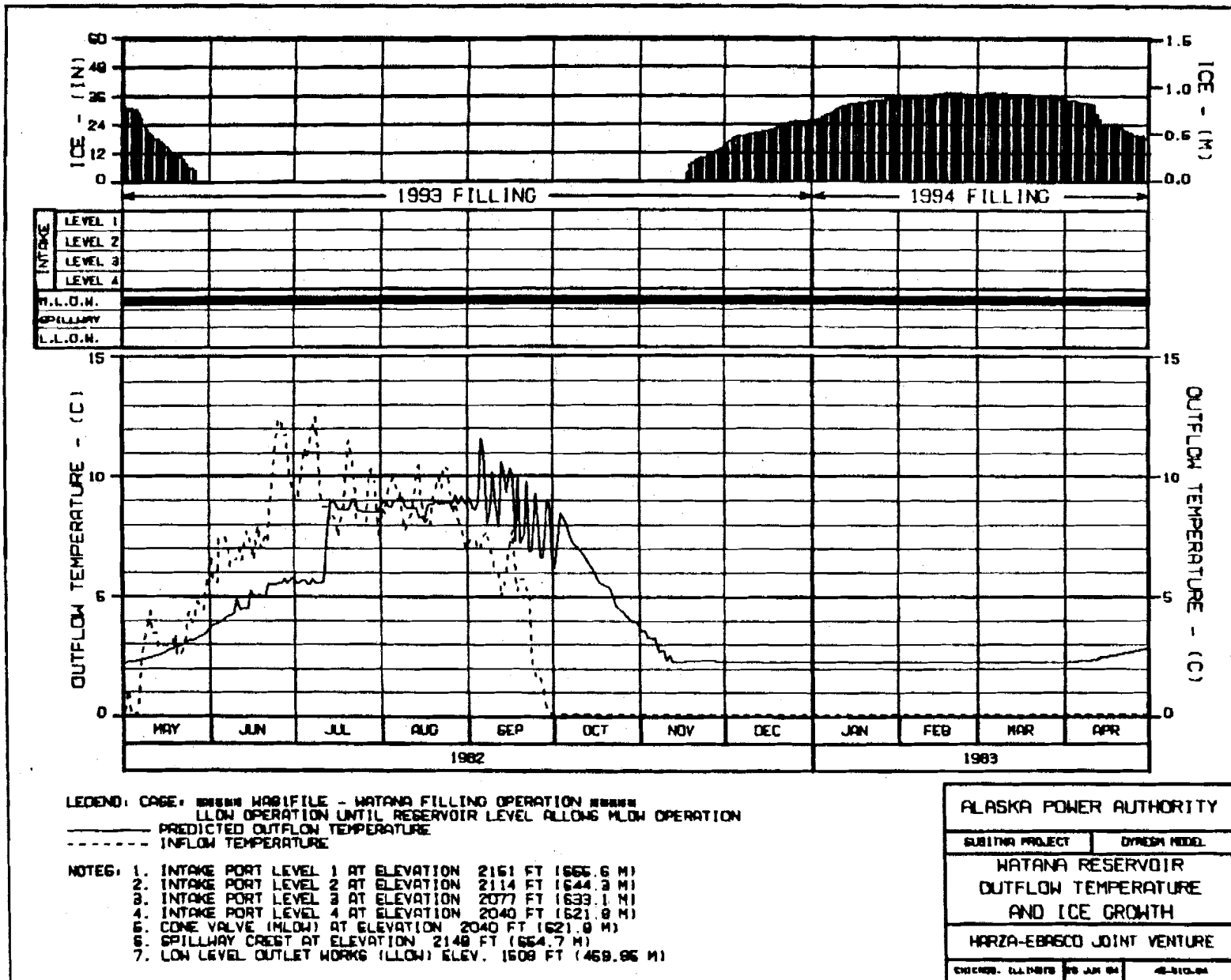
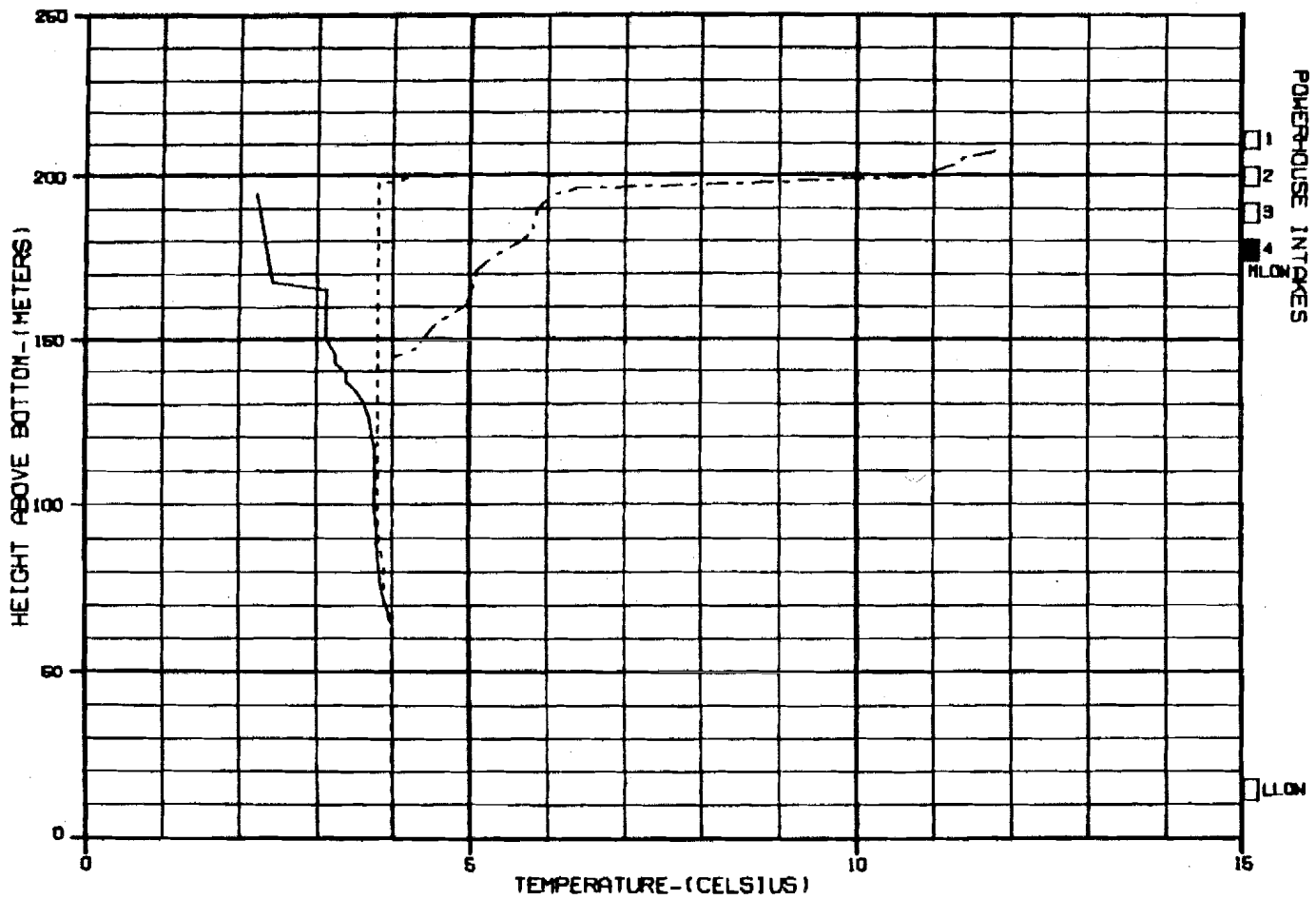


EXHIBIT P

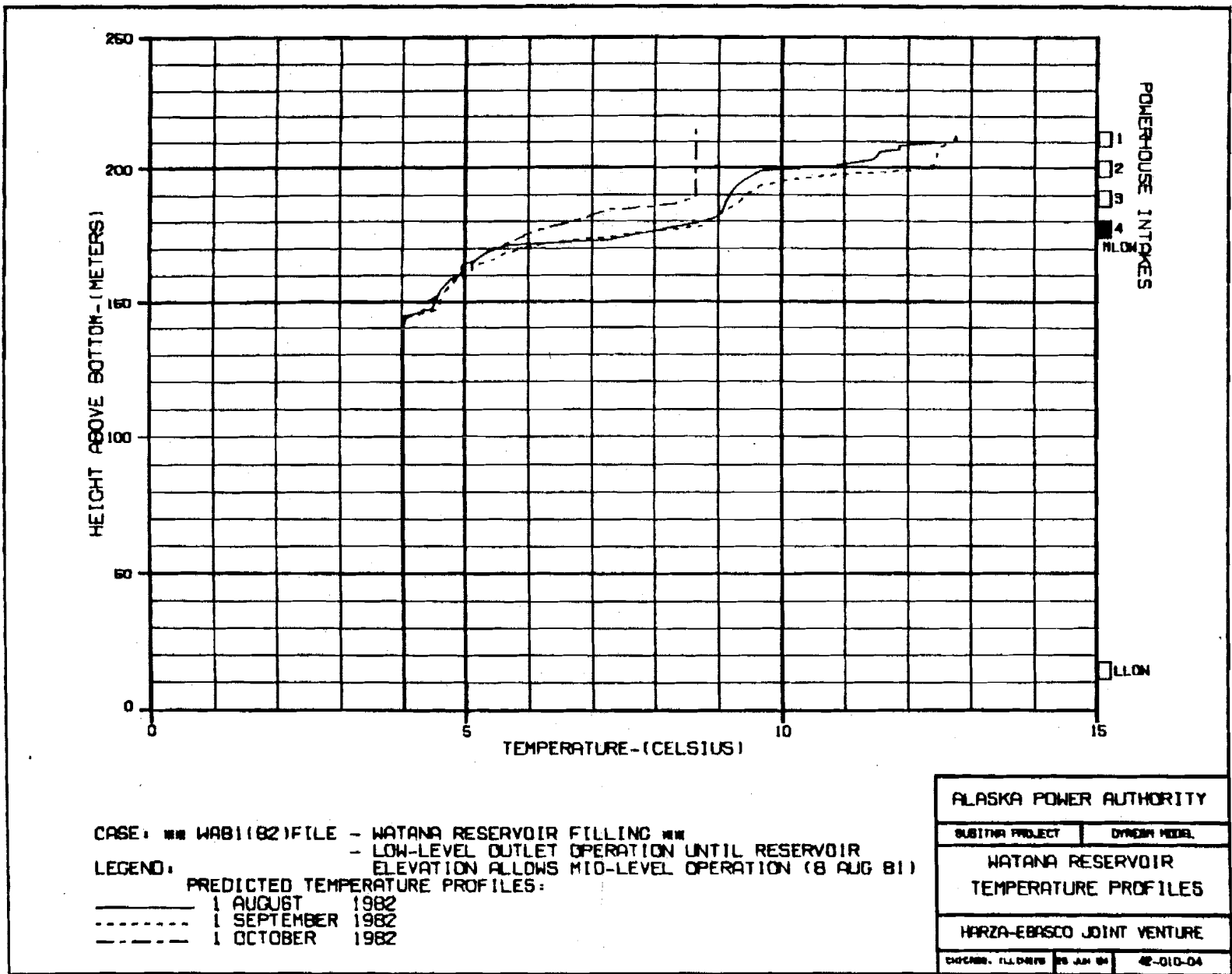


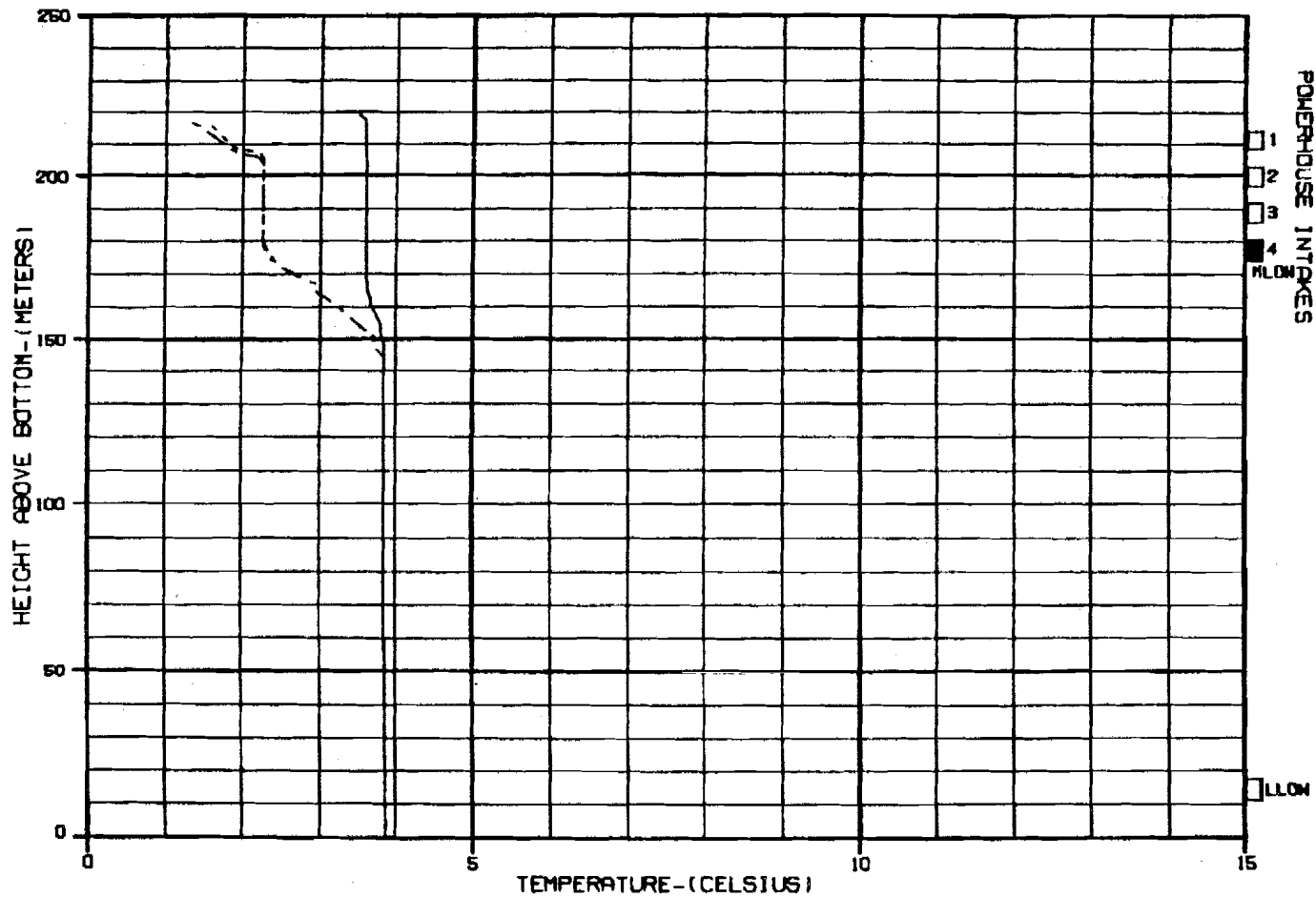


CASE: WAB11821 FILE - WATANA RESERVOIR FILLING
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ | MAY 1982
 - - - - - | JUNE 1982
 - . - . - | JULY 1982

ALASKA POWER AUTHORITY		
SUBTNA PROJECT	DYNEMO MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
CHECKED: B.L. DAVIS	26 JUN 84	42-010-04

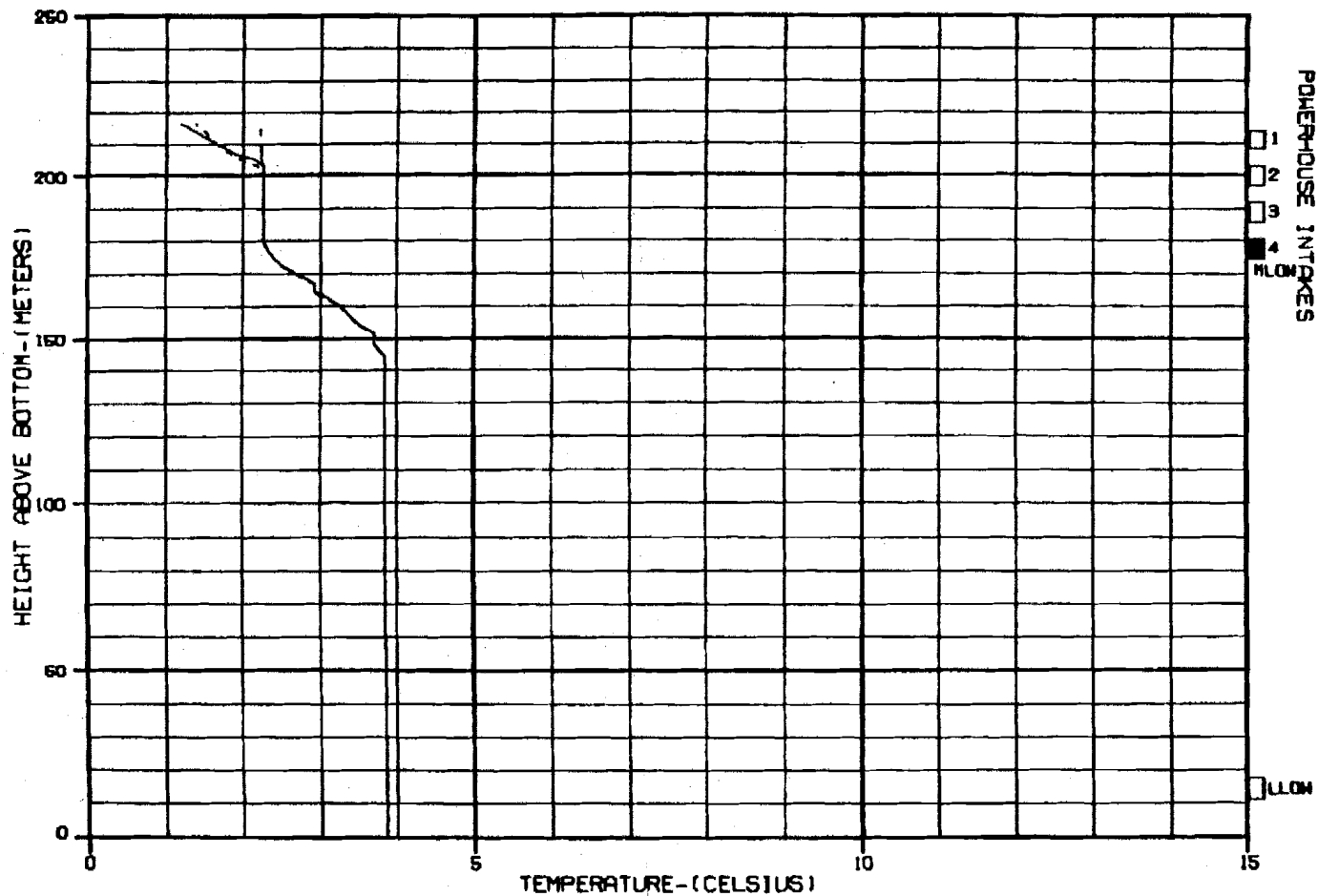




CASE: WAB11821FILE - WATANA RESERVOIR FILLING WAB
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)

LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ | NOVEMBER 1982
 - - - - - | DECEMBER 1982
 - . - . - | JANUARY 1983

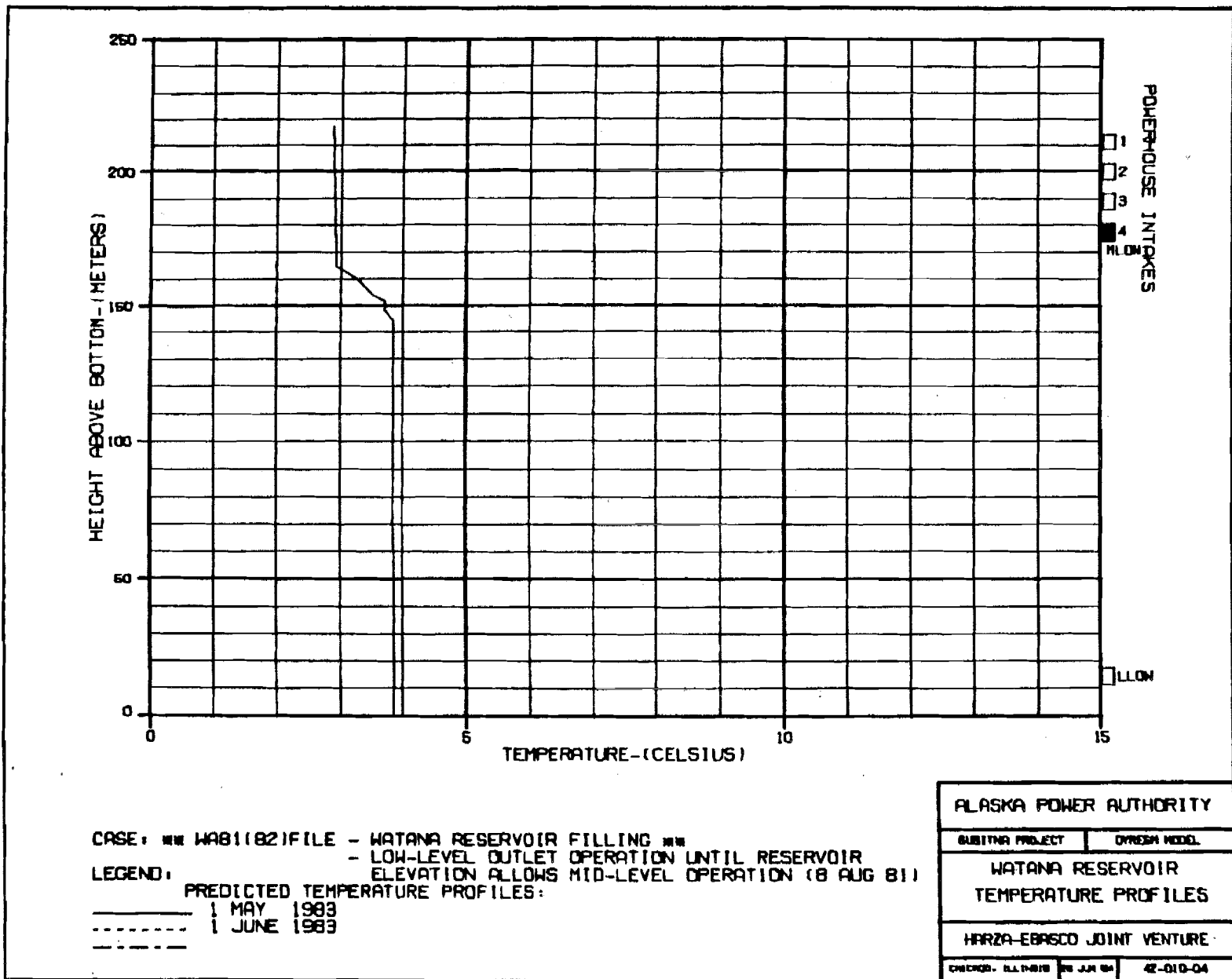
ALASKA POWER AUTHORITY	
EXISTING PROJECT	DYNOSIM MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
CHECKED: B.L.P. 82	20 JAN 84 42-010-04



CASE: WAB11821FILE - WATANA RESERVOIR FILLING
 - LOW-LEVEL OUTLET OPERATION UNTIL RESERVOIR
 ELEVATION ALLOWS MID-LEVEL OPERATION (8 AUG 81)

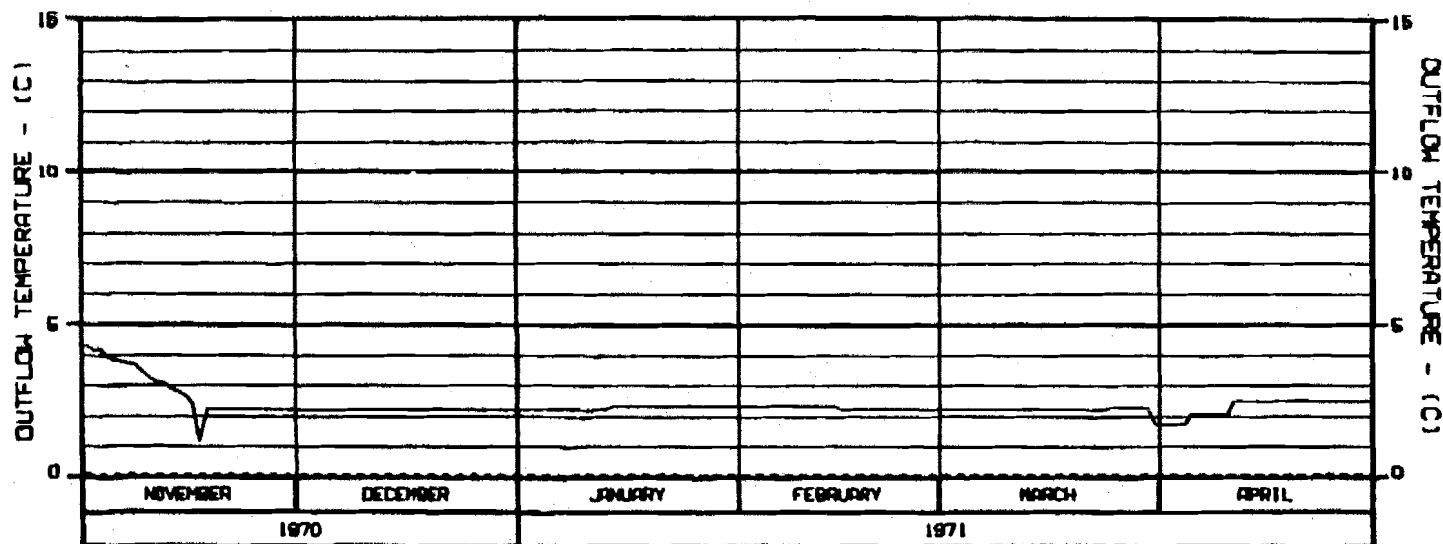
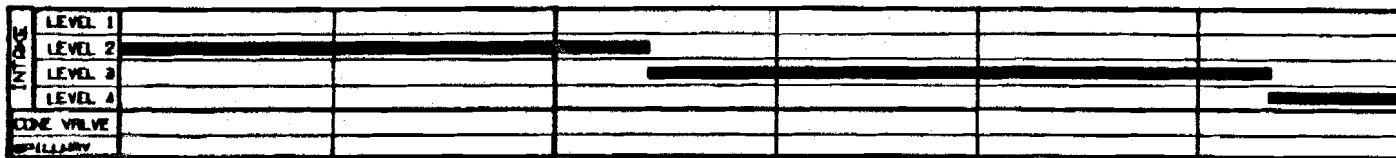
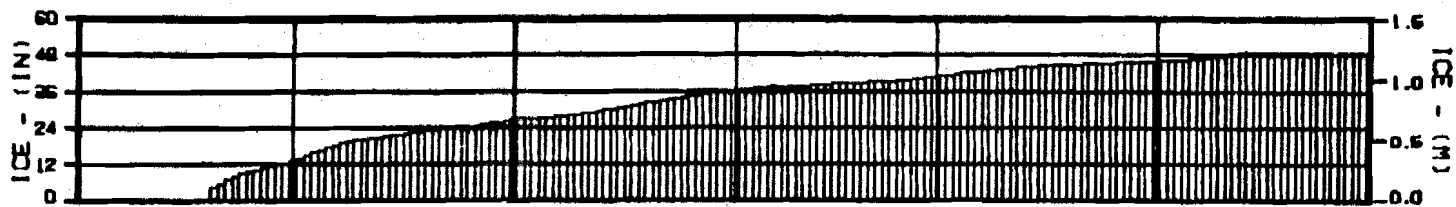
LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 FEBRUARY 1983
 - - - - 1 MARCH 1983
 1 APRIL 1983

ALASKA POWER AUTHORITY	
SUBITNA PROJECT	DYKES MODEL
WATANA RESERVOIR	
TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
DESIGN: ALBERT	28 JAN 84
	42-010-04



WATANA OPERATING
1996 Energy Demands

EXHIBIT Q



LEGEND: CASE: 00 MAY196A - MATANA OPERATION ALONE IN 1966 00

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

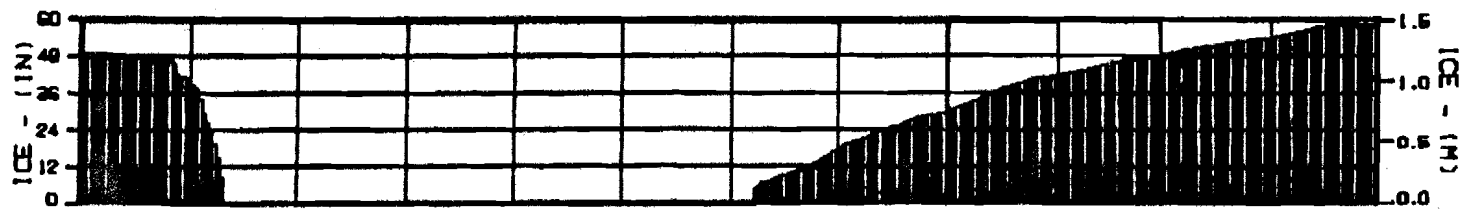
ALASKA POWER AUTHORITY

OUTFLOW PROJECT | DRYDOWN MODEL

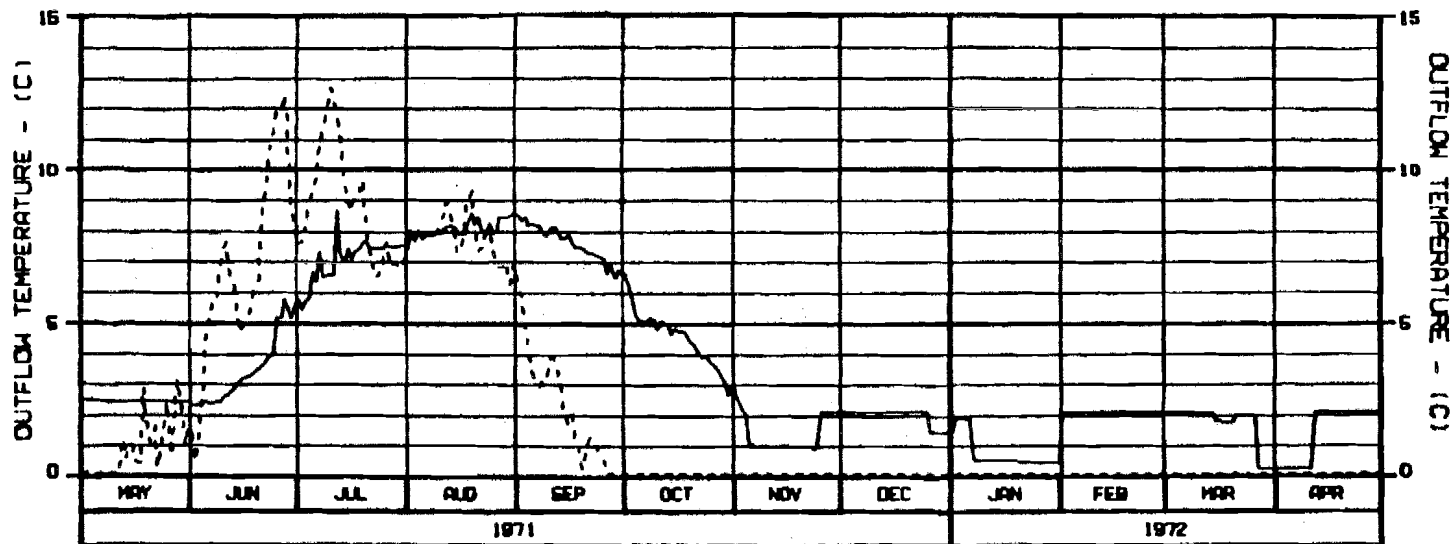
MATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DESIGNER - B.L.DENNY | 5 JAN 81 | 48-000-01



INTAKE	LEVEL 1																			
	LEVEL 2																			
	LEVEL 3																			
	LEVEL 4																			
	LINE VALVE																			
	SPILLWAY																			



LEGEND: CASE: 88 MAY196A - WATANA OPERATION ALONE IN 1966 WA

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

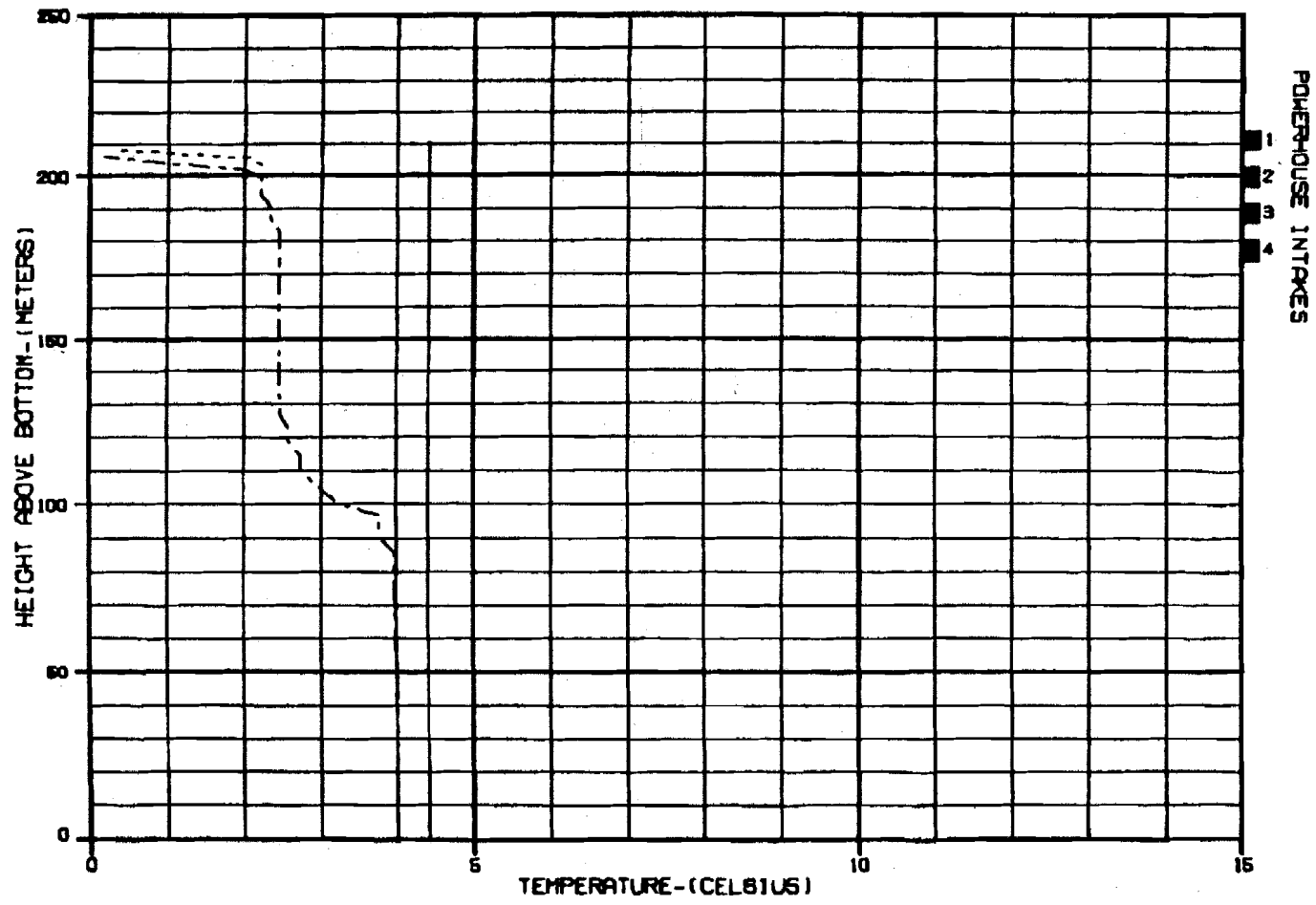
ALASKA POWER AUTHORITY

GLUITHA PROJECT OPENED MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

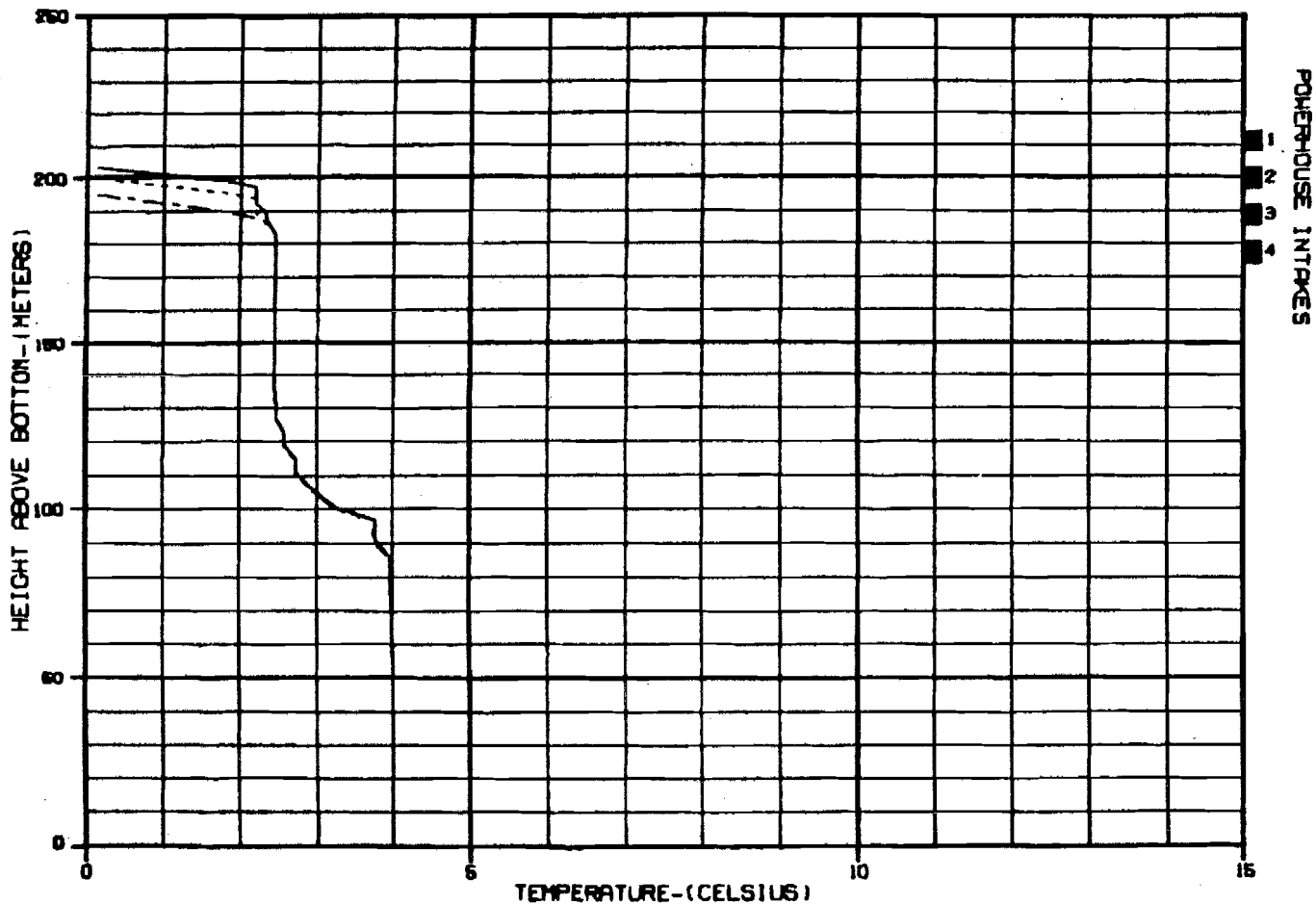
CHRYSLER, ILLINOIS 9 JAN 81 42-100-01



CASE: ■■ WA7196A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— 1 NOVEMBER 1970
 1 DECEMBER 1970
 - - - - 1 JANUARY 1971

ALASKA POWER AUTHORITY		
SUBMITTER PROJECT	DYNAMIC MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DESIGNER: ILLINOIS	DATE: 8 JAN 81	REV: 010-04



CASE: ■■ WA7196A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | FEBRUARY 1971
 - - - | MARCH 1971
 - · - · | APRIL 1971

ALASKA POWER AUTHORITY

EXISTING PROJECT

OPERATION MODEL

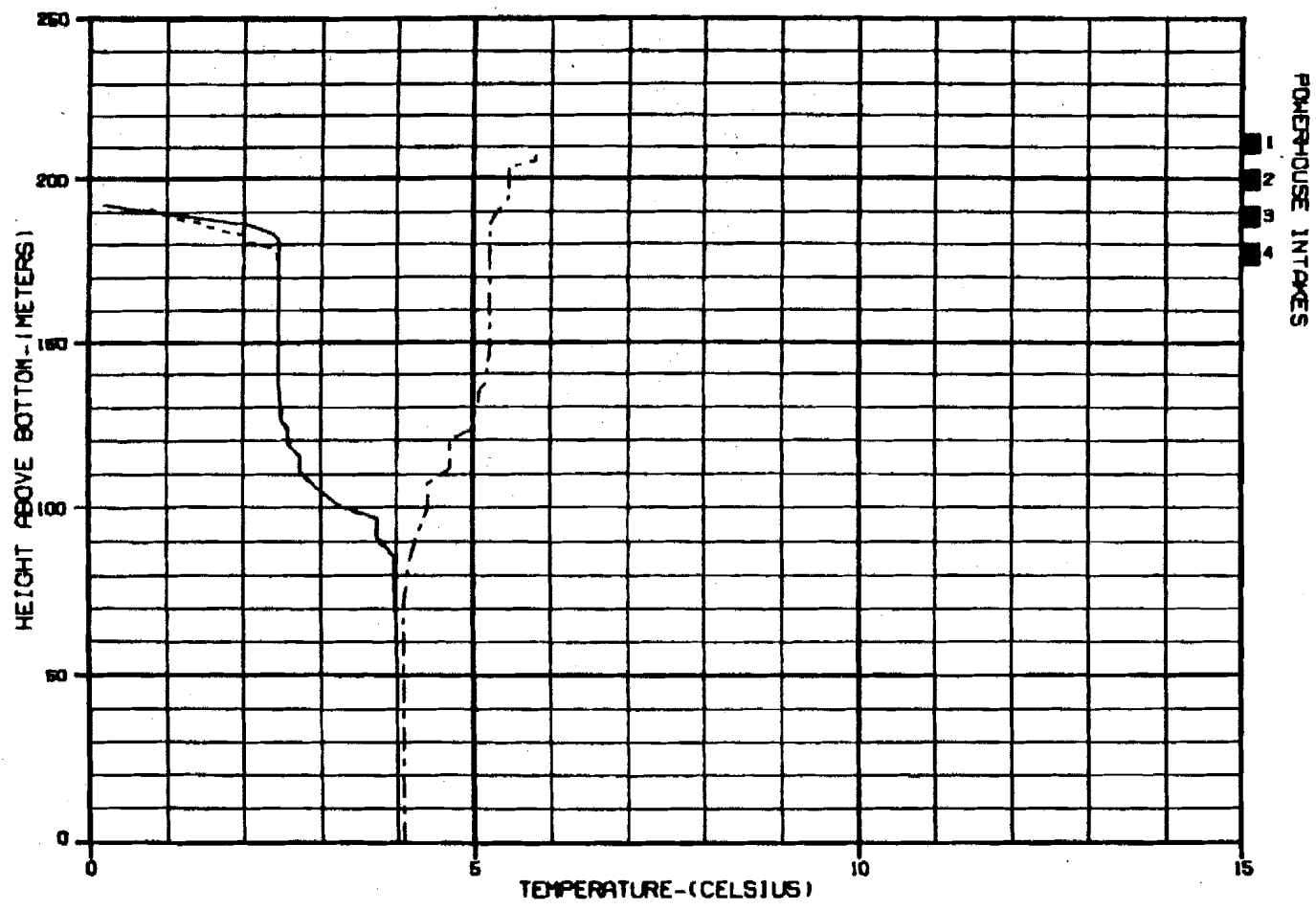
WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

PROJECT: WA7196A

DATE: 0 JAN 81

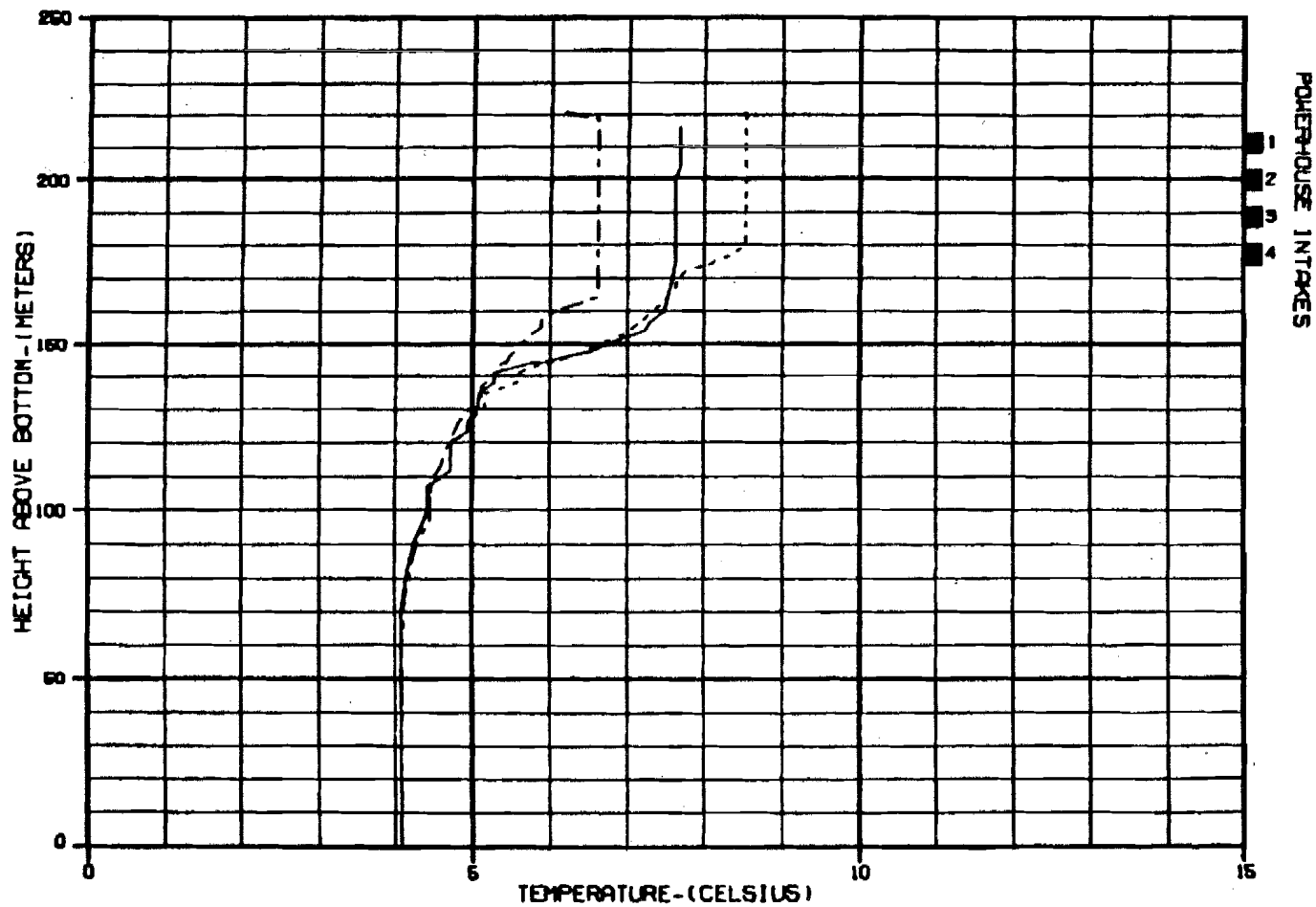
42-010-04



CASE: ■■ WA7196A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 MAY 1971
 - - - - - 1 JUNE 1971
 - · - · - 1 JULY 1971

ALASKA POWER AUTHORITY		
QUALITY PROJECT	DYNEM MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
ENCLOSURE: S.A. 1996	8 JAN 84	42-010-04



CASE: ■■ WA7196A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 AUGUST 1971
 - - - 1 SEPTEMBER 1971
 - · - · 1 OCTOBER 1971

ALASKA POWER AUTHORITY

WATANA PROJECT

OPERATION MODEL

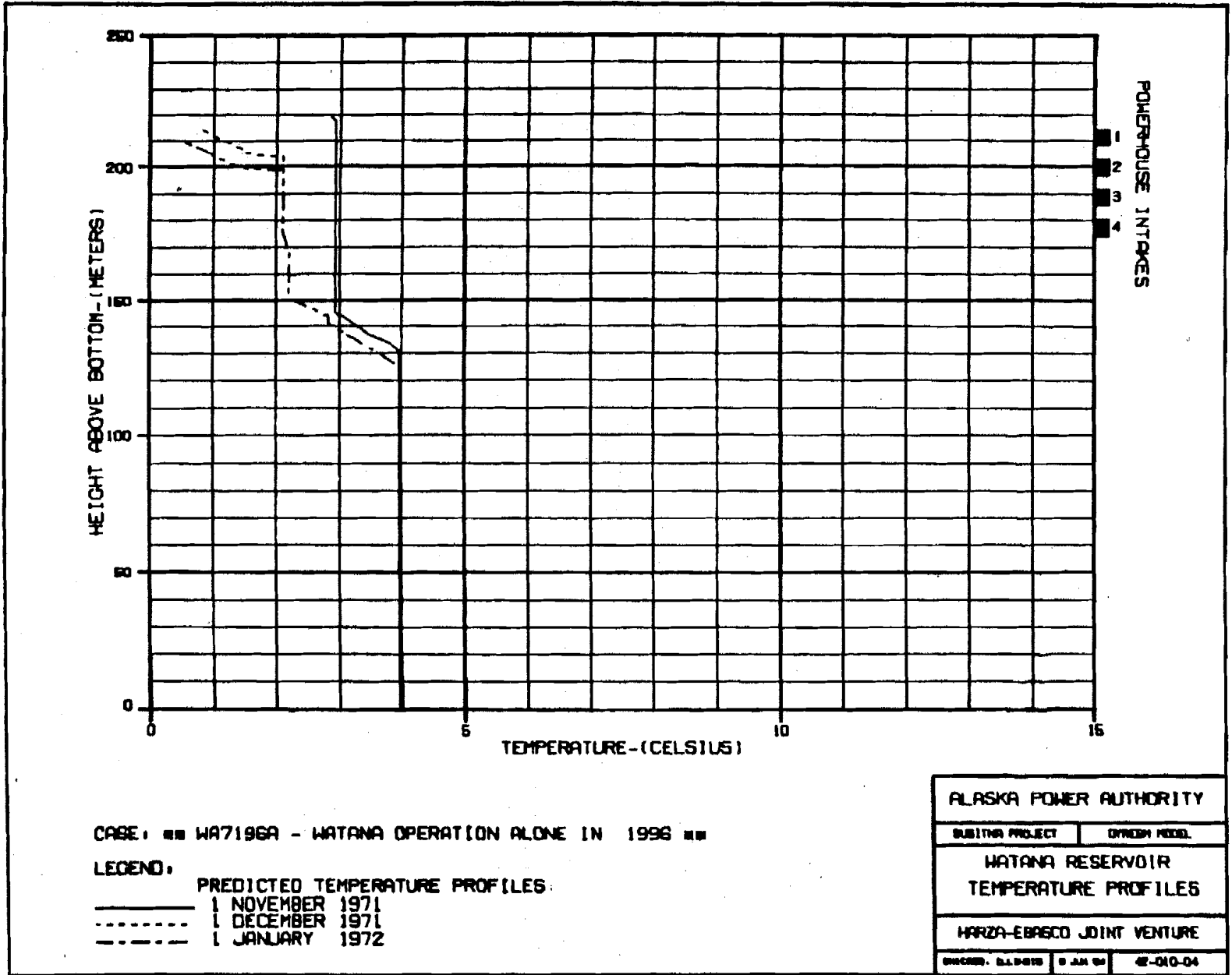
WATANA RESERVOIR
 TEMPERATURE PROFILES

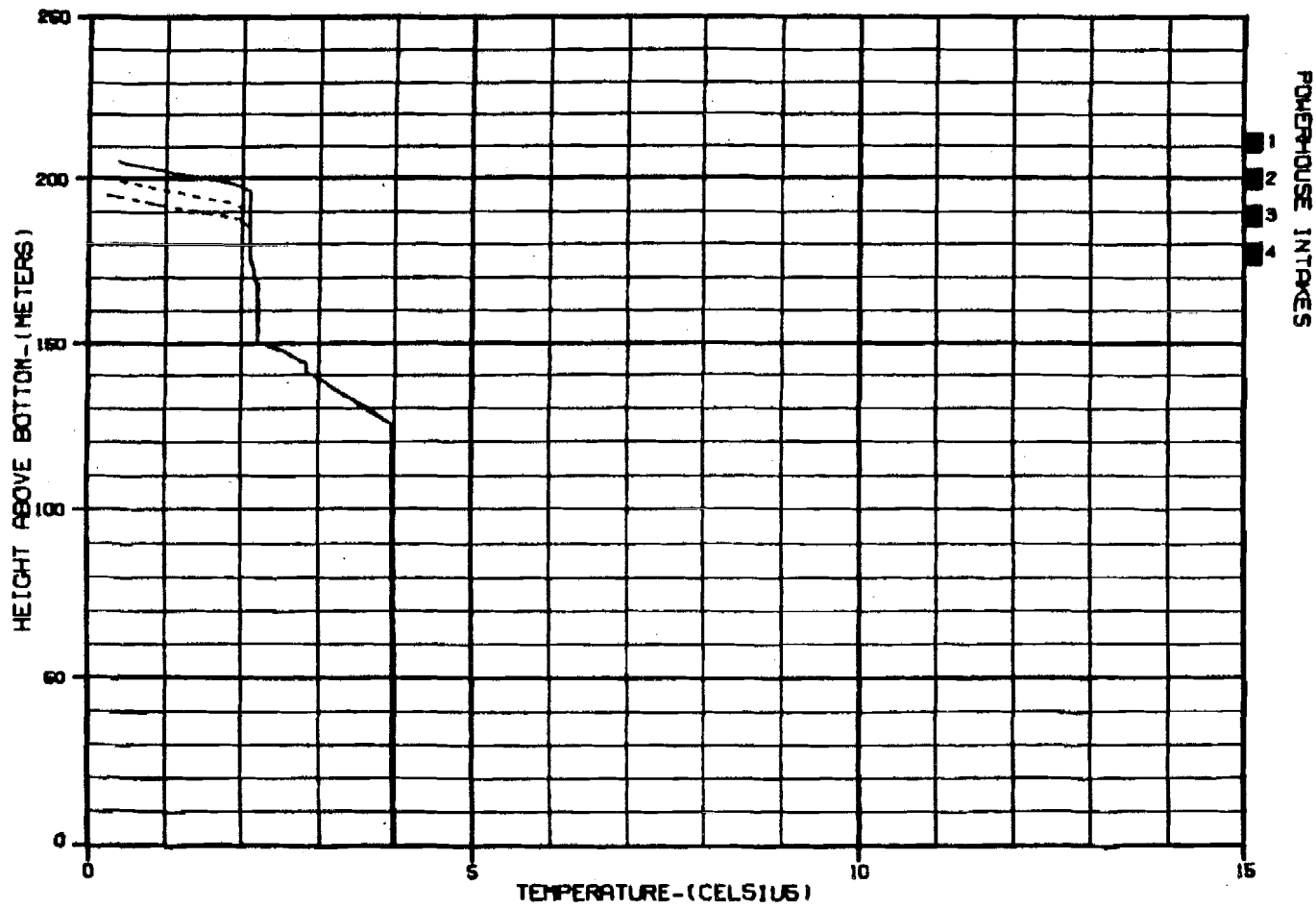
HARZA-EBASCO JOINT VENTURE

OWNER: ALASKA

8 JUN 88

4E-010-04





CASE: ■■ WA7196A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | FEBRUARY 1972
 | MARCH 1972
 - - - - | APRIL 1972

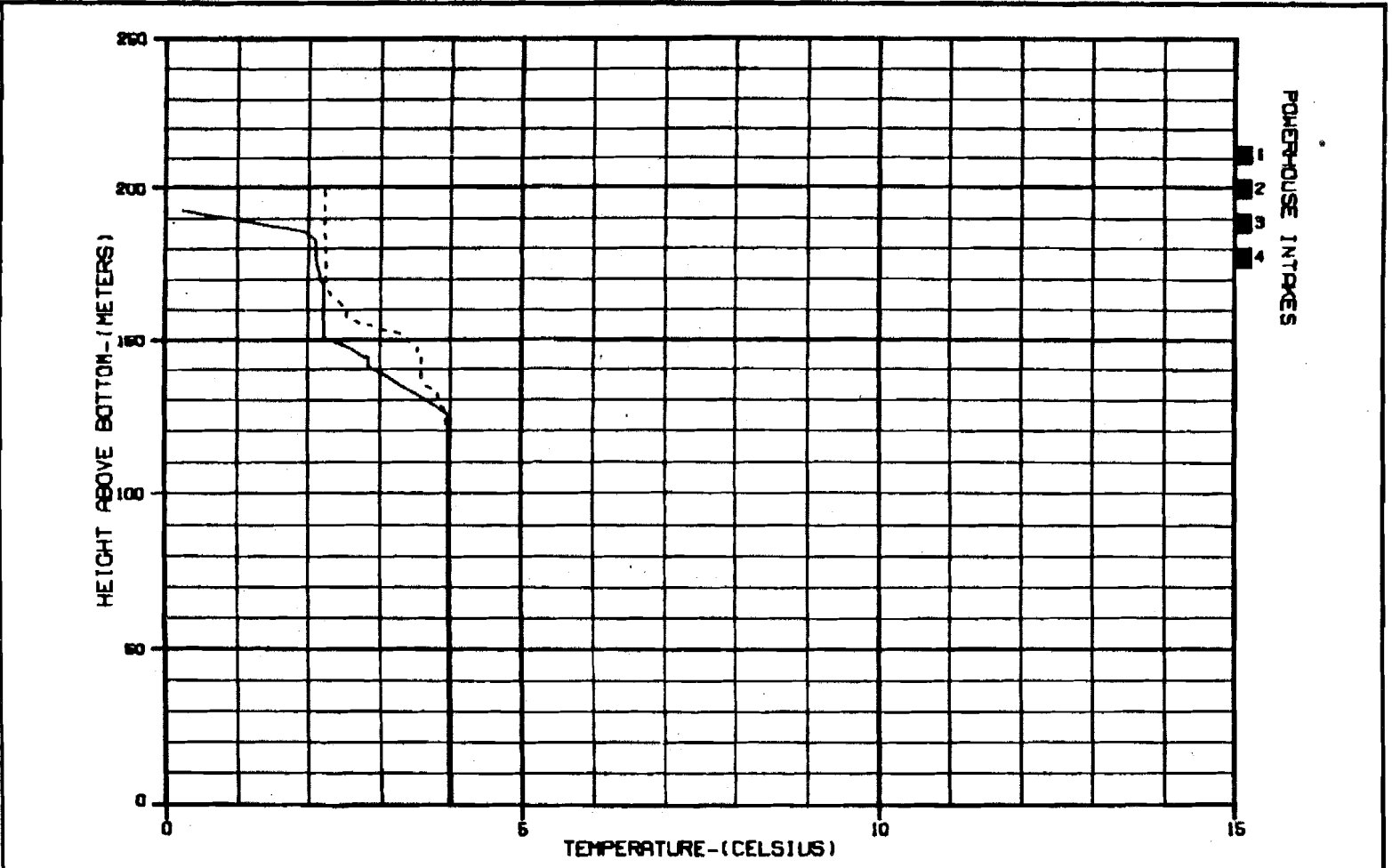
ALASKA POWER AUTHORITY

SUBMITTER PROJECT DYNOMON MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHOPER, S.L. 1996 8 JAN 84 42-010-04

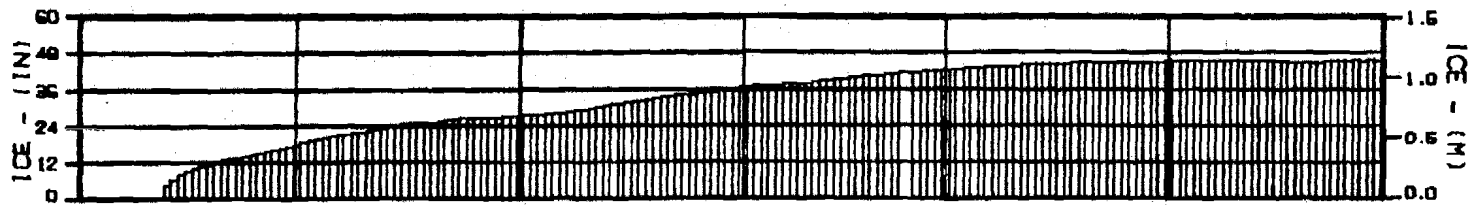


CASE: ■■ WA7198A - WATANA OPERATION ALONE IN 1996 ■■

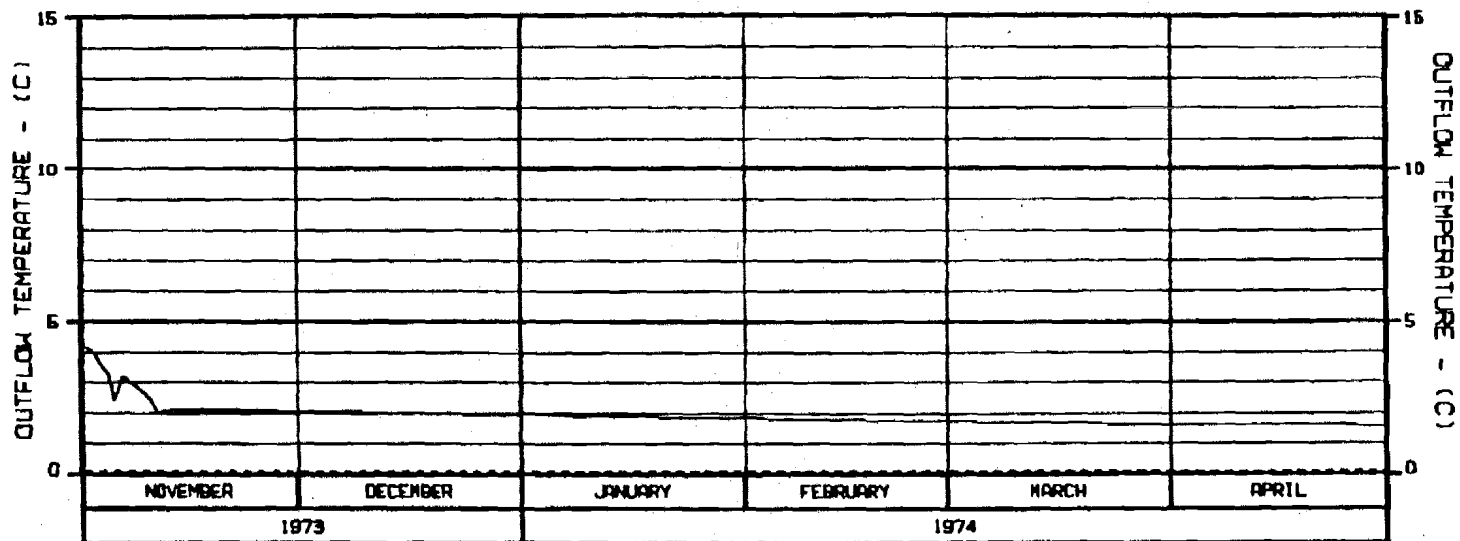
LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ——— | MAY 1972
 | JUNE 1972
 - - - - | JULY 1972

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	OPERATION MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
UNIVERS. ALASKA	42-010-04

EXHIBIT R



INTAKE	LEVEL 1				
	LEVEL 2				
	LEVEL 3				
	LEVEL 4				
	CONE VALVE				
	SPILLWAY				



LEGEND: CASE: 88 WATANA OPERATION ALONE IN 1996 88

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

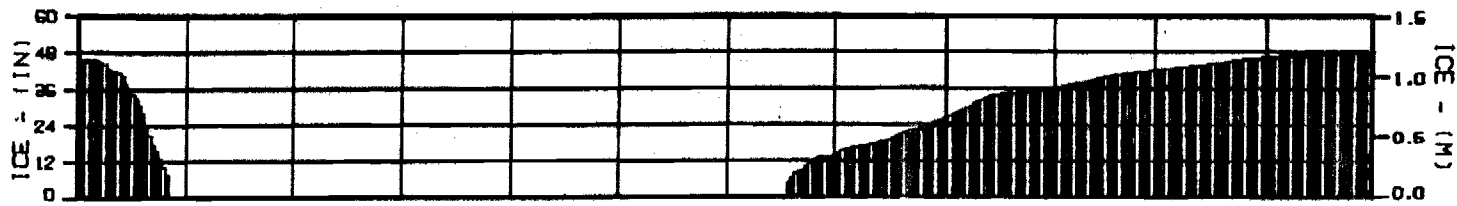
ALASKA POWER AUTHORITY

SUBSTRA PROJECT DYNESH MODEL

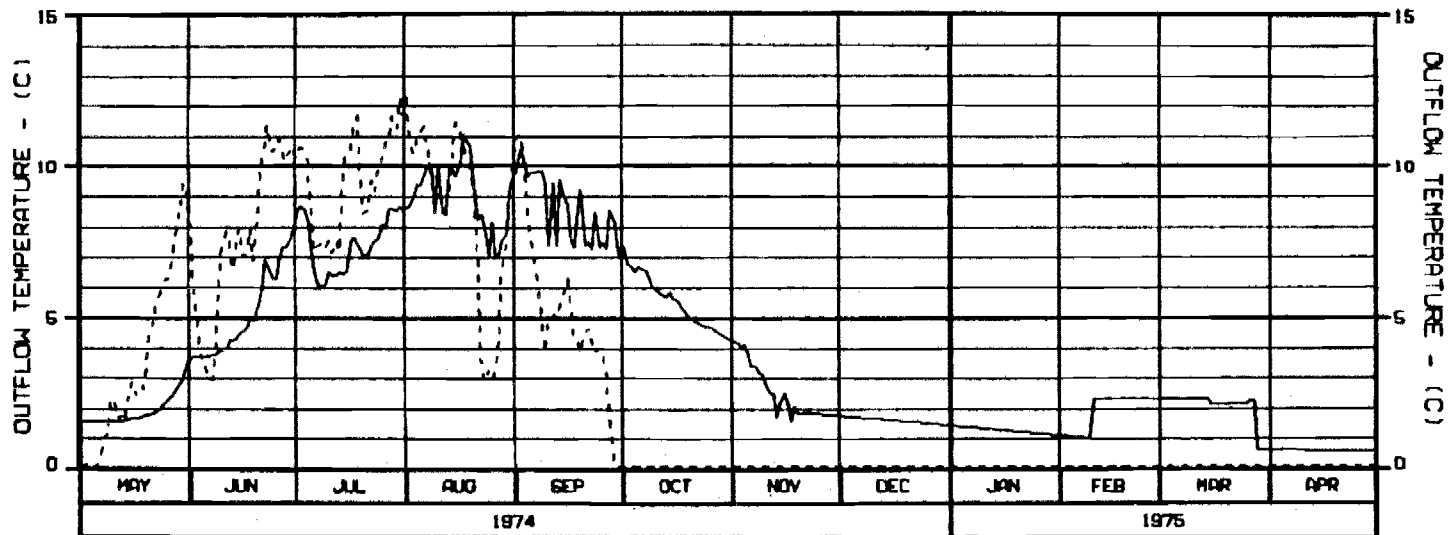
WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

CHUCK, ILLIUM 8 JAN 84 48-810-84



INTAKE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	CONE VALVE	SPILLWAY
	██████████	██████████	██████████	██████████	██████████	██████████
		██████████	██████████	██████████	██████████	██████████
	██████████		██████████	██████████	██████████	██████████
				██████████	██████████	██████████
					██████████	██████████
						██████████



LEGEND: CASE: ■ W7496A - WATANA OPERATION ALONE IN 1996 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTE: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

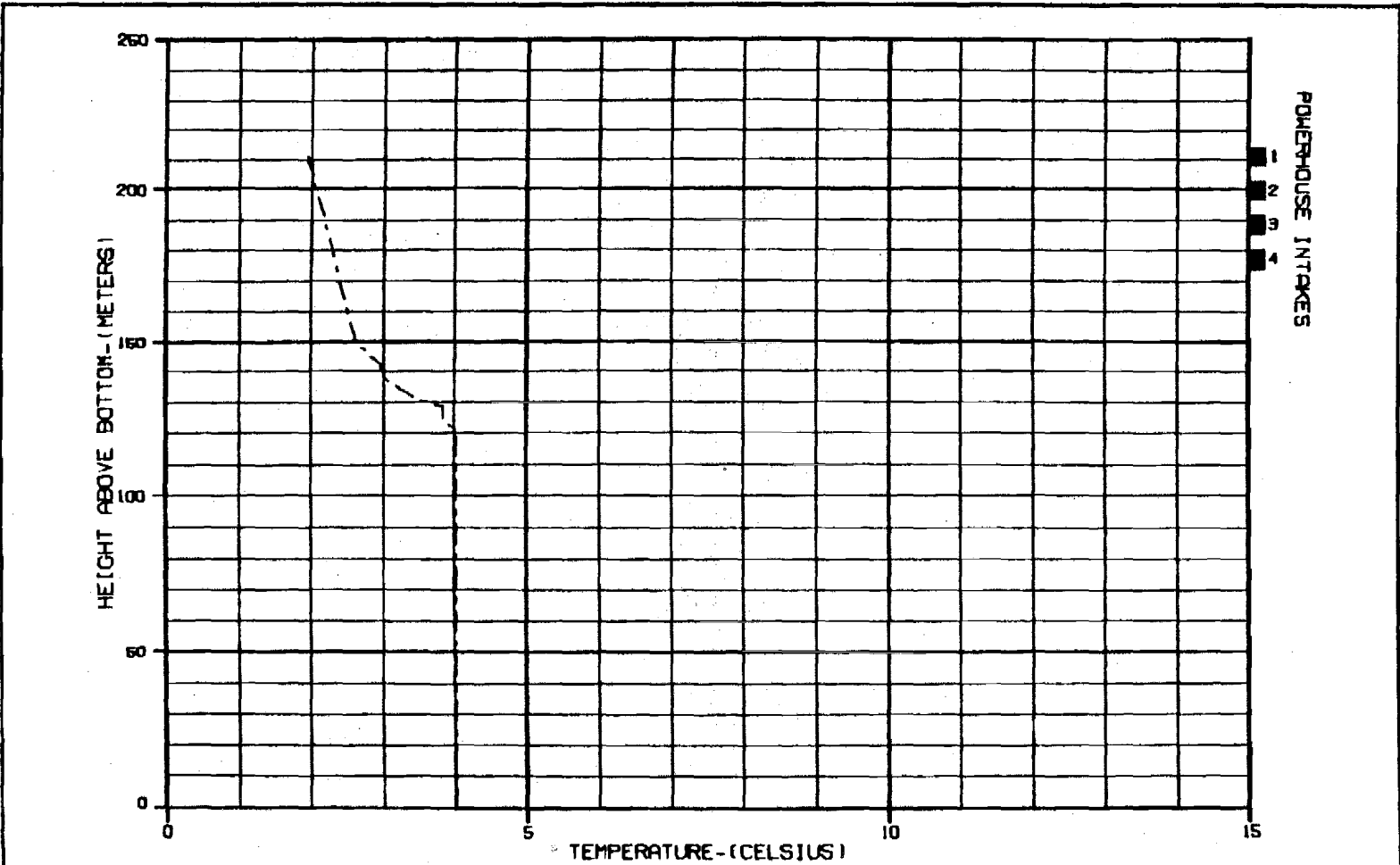
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DYNESH MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

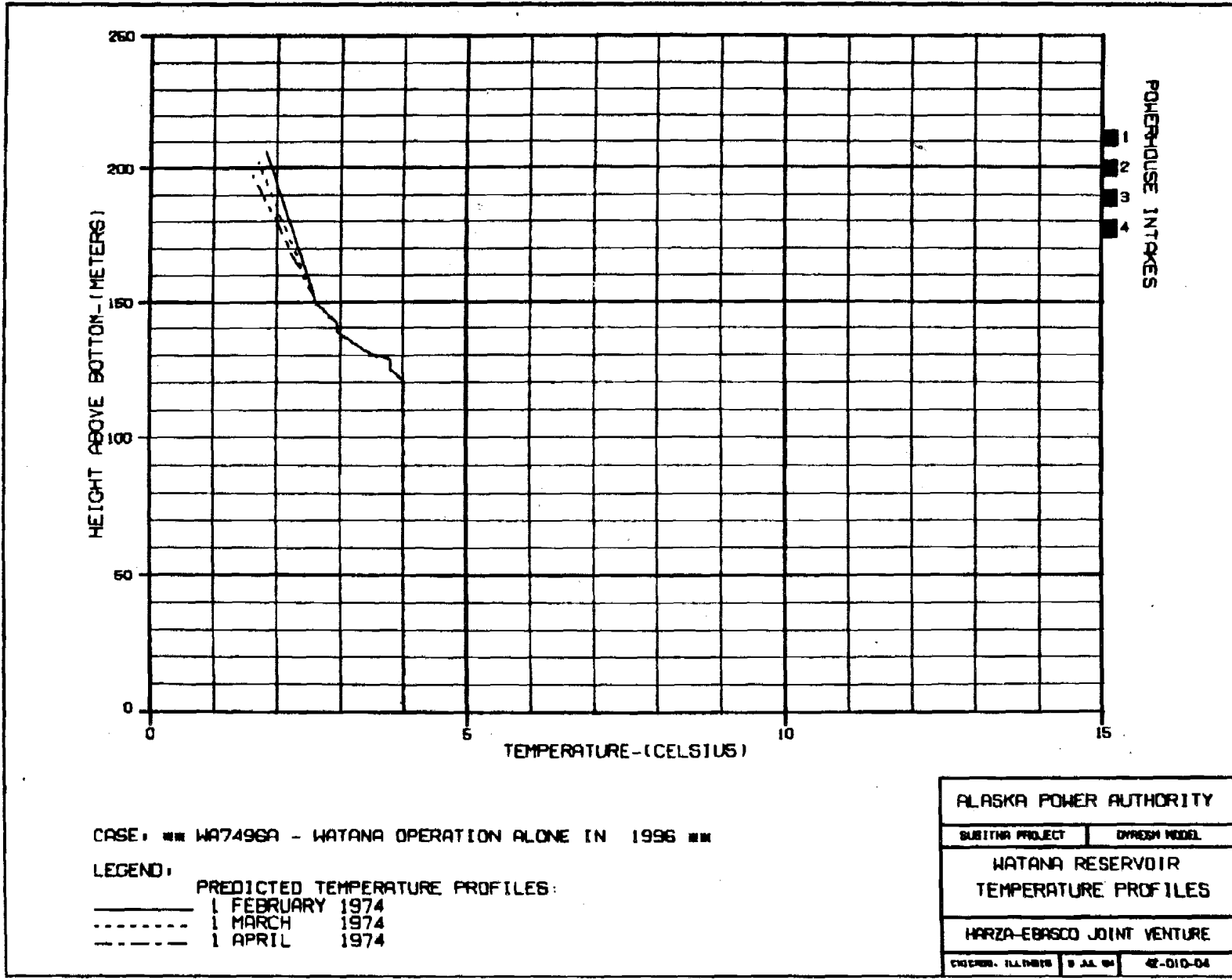
CHGNOB. 04-10-85 9 JUL 84 49-910-04

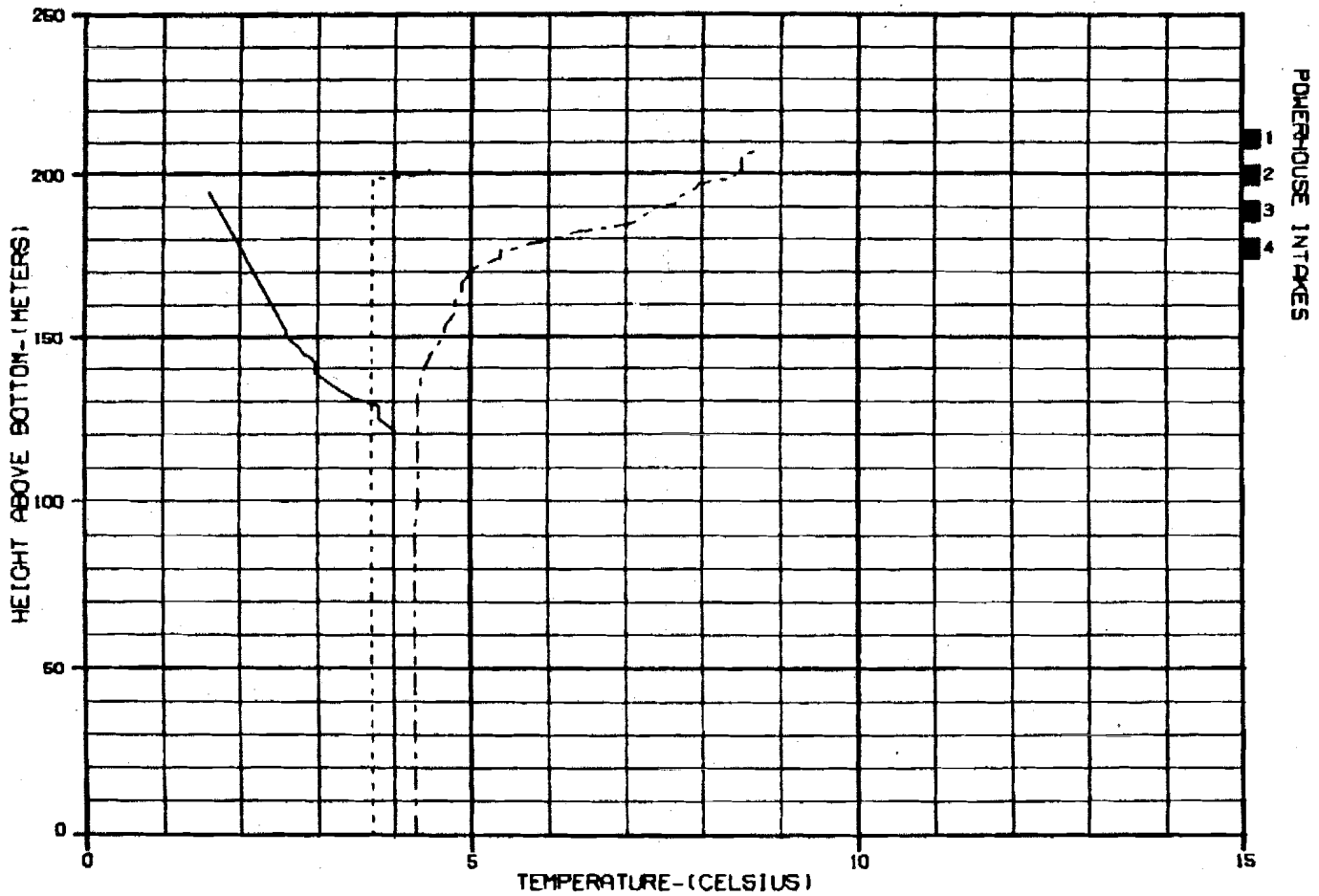


CASE: WA7496A - WATANA OPERATION ALONE IN 1996

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— 1 NOVEMBER 1973
 - - - - 1 DECEMBER 1973
 - · - · 1 JANUARY 1974

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	CFRASH MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
OWNER: ALASKA	SCALE	42-010-04





CASE: ■■ WA7496A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 MAY 1974
- - - 1 JUNE 1974
- · - · 1 JULY 1974

ALASKA POWER AUTHORITY

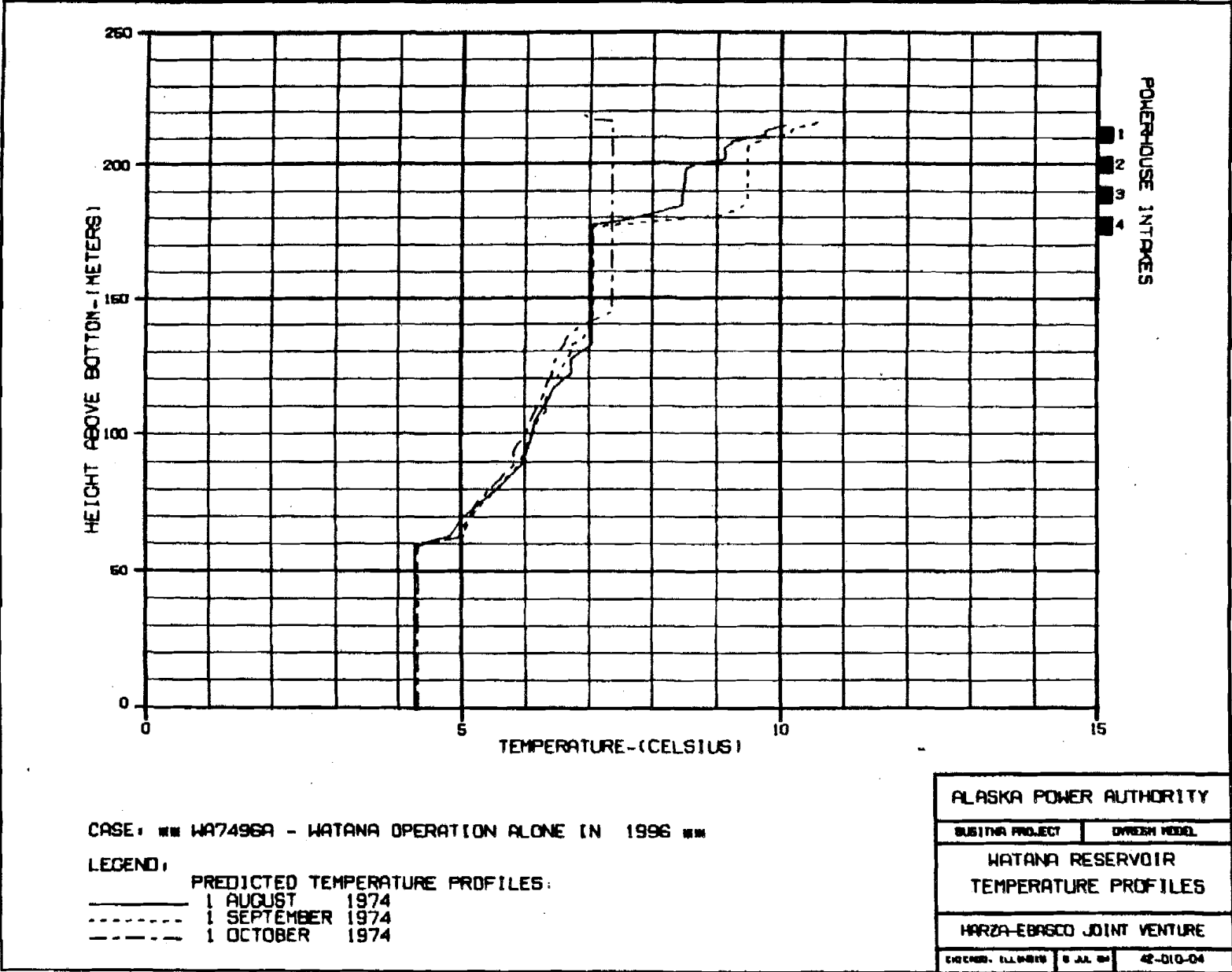
SUBMITTA PROJECT

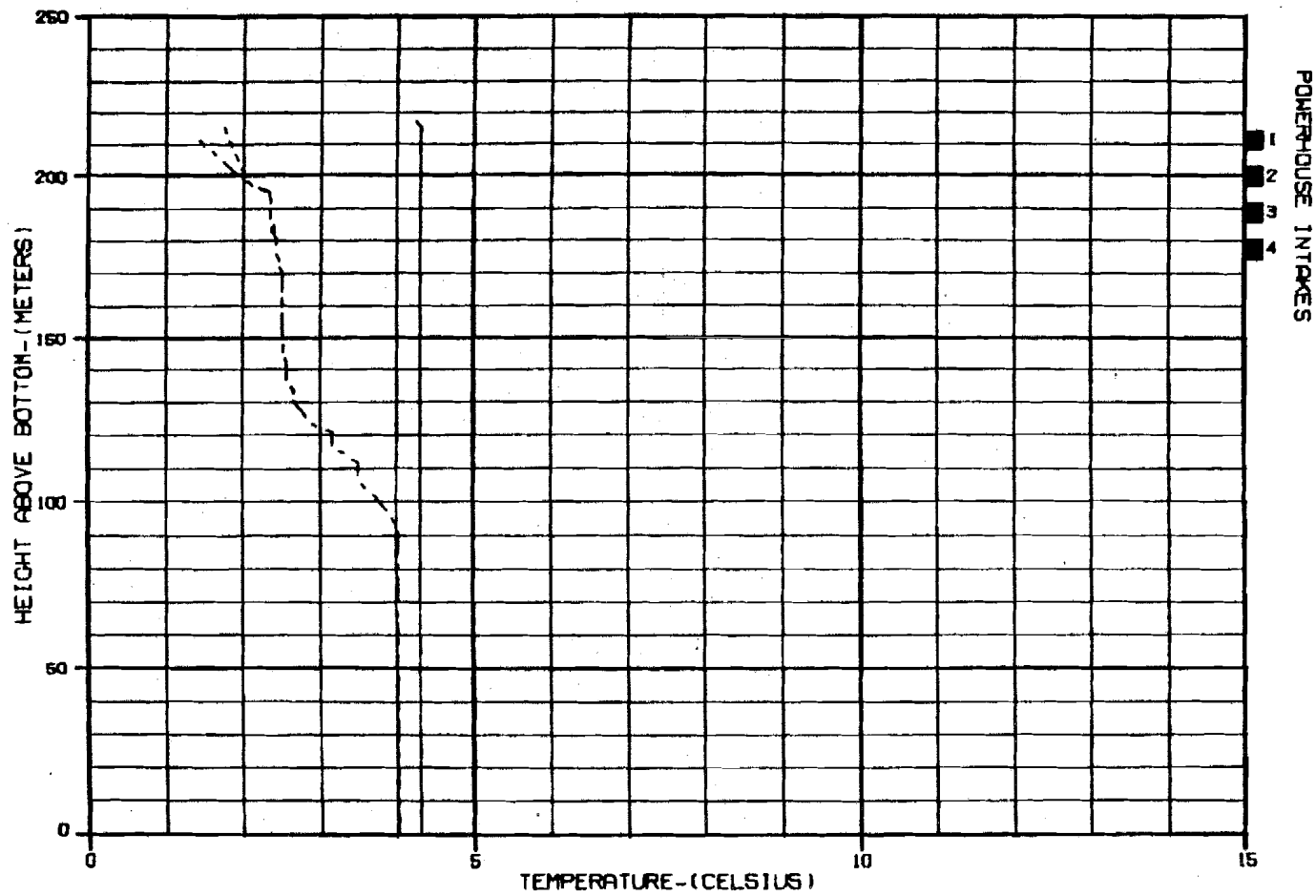
DYNEM MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

ENCLOSURE - ALL PARTS 5 JUL 84 42-010-04





CASE: WA7496A - WATANA OPERATION ALONE IN 1996

LEGEND:

PREDICTED TEMPERATURE PROFILES

- 1 NOVEMBER 1974
- 1 DECEMBER 1974
- · - · - 1 JANUARY 1975

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OPERATION MODEL

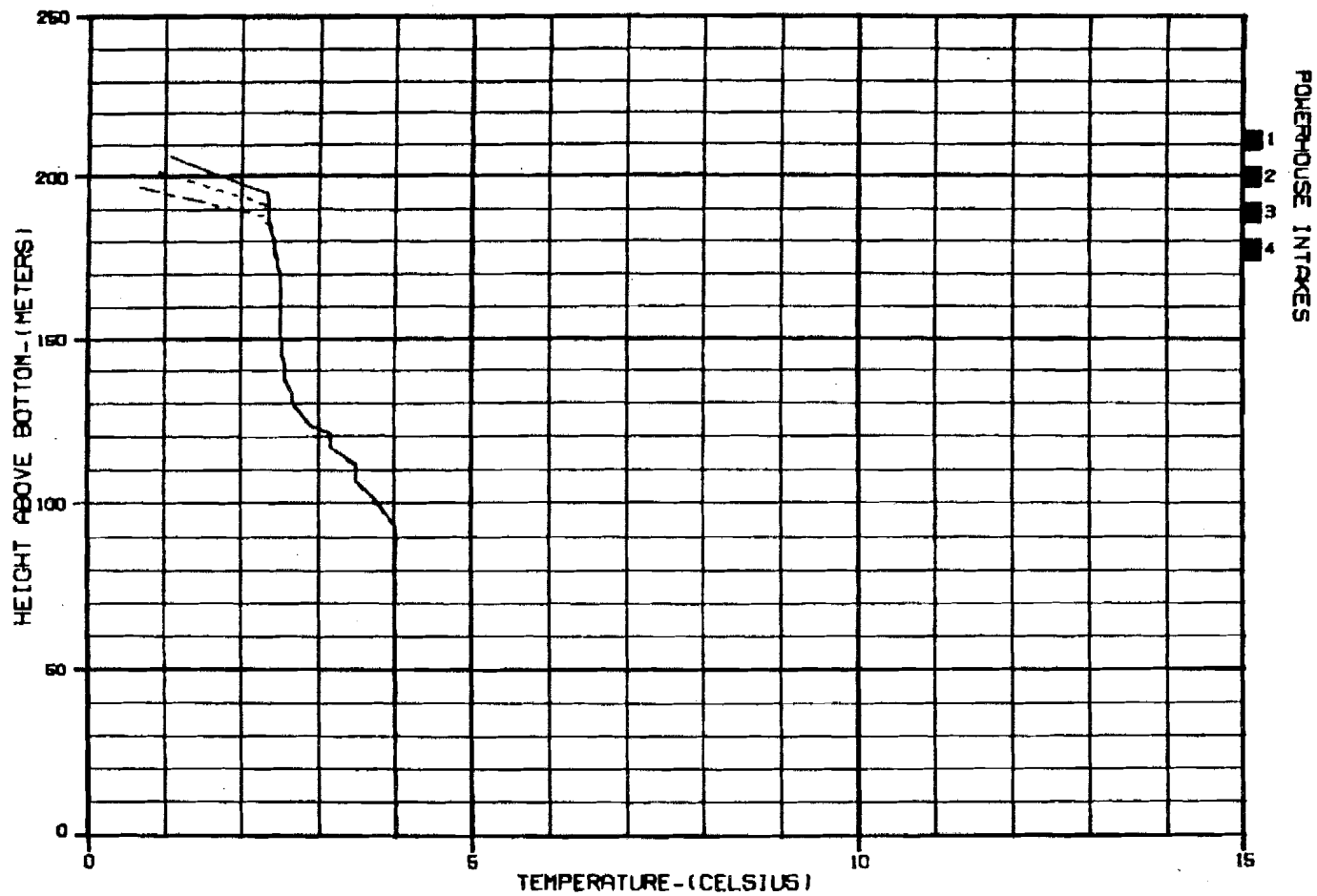
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHANGES: ALL-DIGIT

8 JUL 84

42-D10-04



CASE: ■■ WA7496A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— 1 FEBRUARY 1975
 - - - - 1 MARCH 1975
 - · - · 1 APRIL 1975

ALASKA POWER AUTHORITY

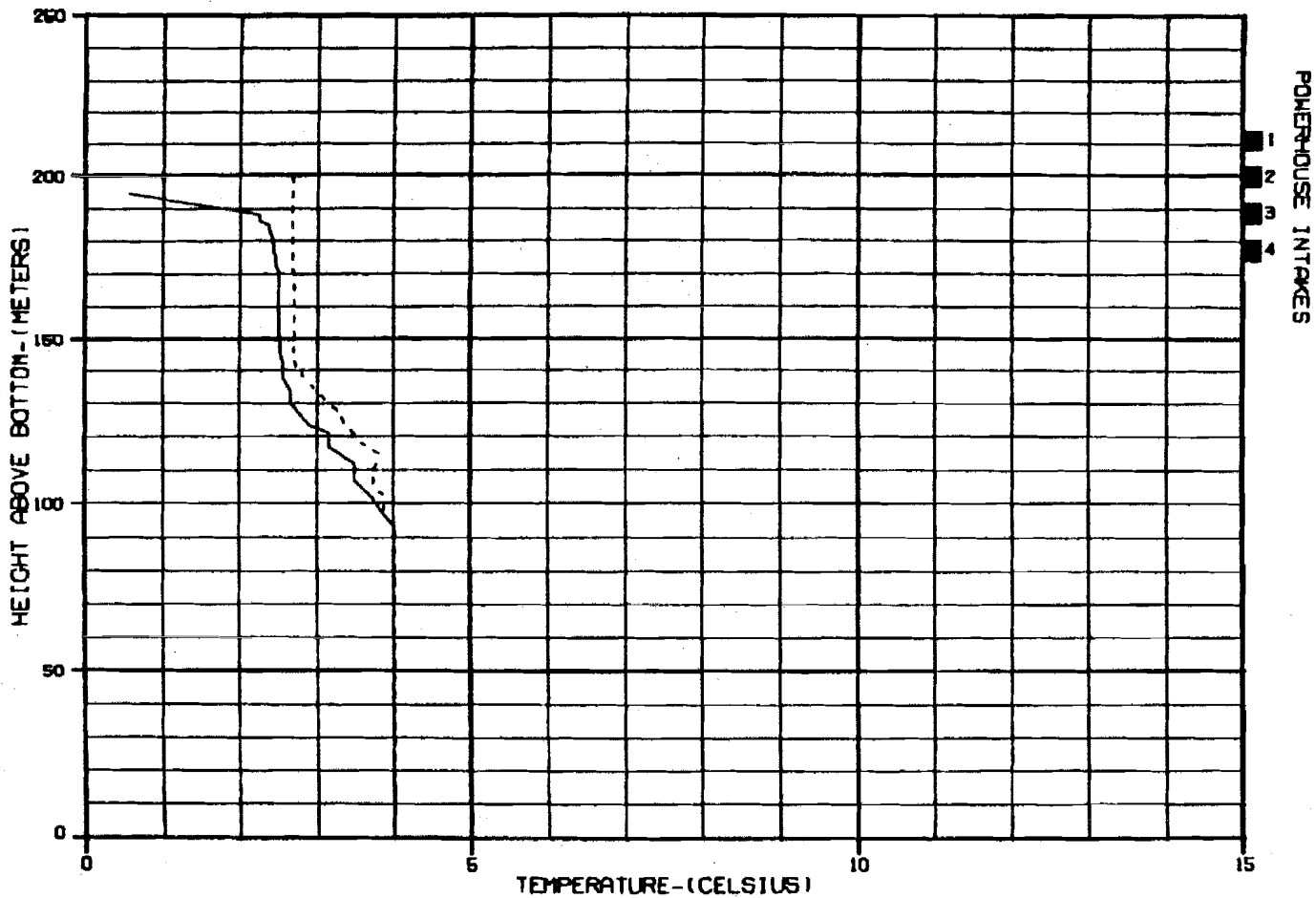
WATANA PROJECT

DYKESH HEAD

WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

CHUCKER, ELLIOTT & ASSOCIATES 42-010-04



CASE: W W WA7496A - WATANA OPERATION ALONE IN 1996 W W

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 MAY 1975
 - - - 1 JUNE 1975
 - · - · 1 JULY 1975

ALASKA POWER AUTHORITY

SUBTINA PROJECT

DYNEMO MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

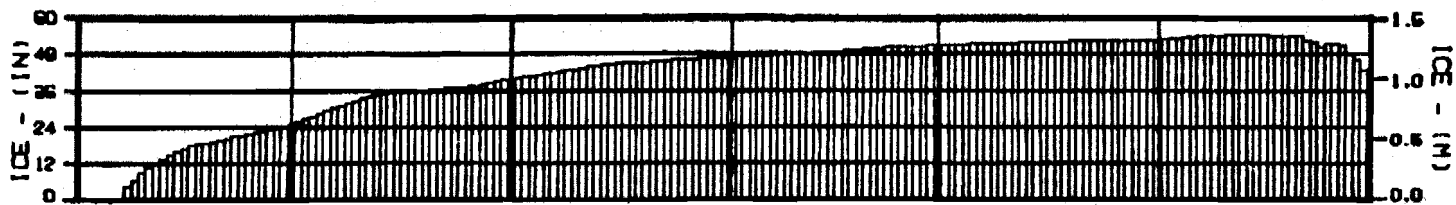
HARZA-EBASCO JOINT VENTURE

CHUCK. B.L.P. 88

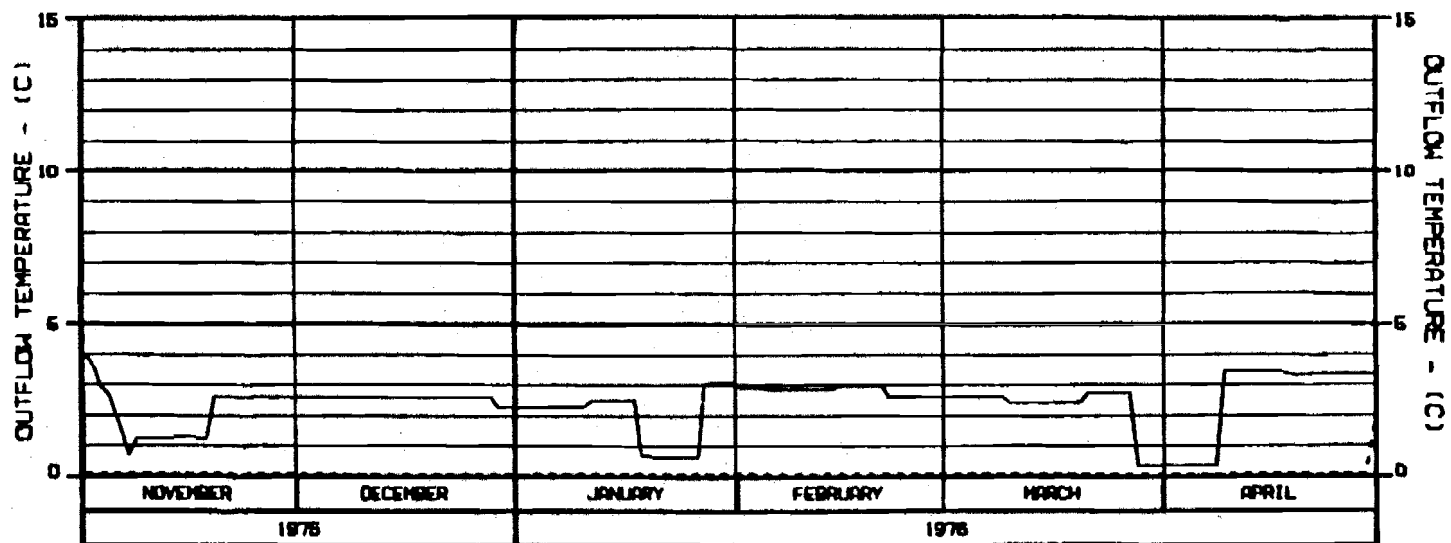
8 JUL 88

42-010-04

EXHIBIT S



INTAKE	LEVEL 1				
	LEVEL 2				
	LEVEL 3				
	LEVEL 4				
	CONE VALVE				
	SPILLWAY				



LEGEND: CASE: HA7686A - WATANA OPERATION ALONE IN 1986

— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

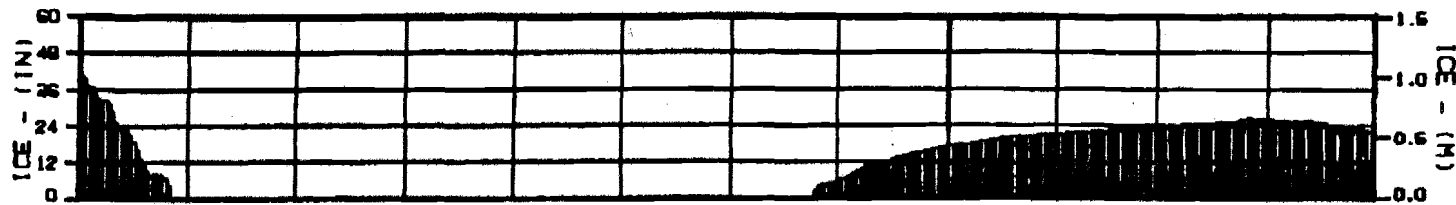
ALASKA POWER AUTHORITY

SUBMITTER PROJECT OPERATOR MODEL

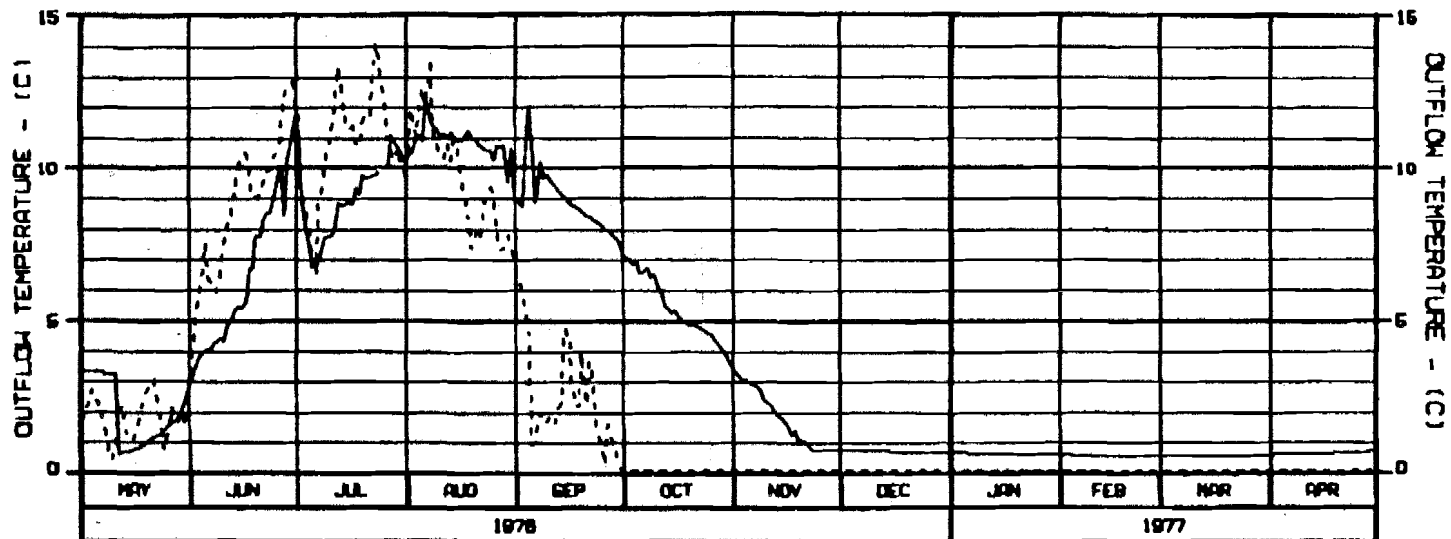
WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DATE: 11/1986 8 JAN 87 4-100-86



	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
INTAKE LEVEL 1												
INTAKE LEVEL 2												
INTAKE LEVEL 3												
INTAKE LEVEL 4												
ONE VALVE												
SPILLWAY												



LEGEND: CASE: 88 WATRES6A - WATANA OPERATION ALONE IN 1986

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. ONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

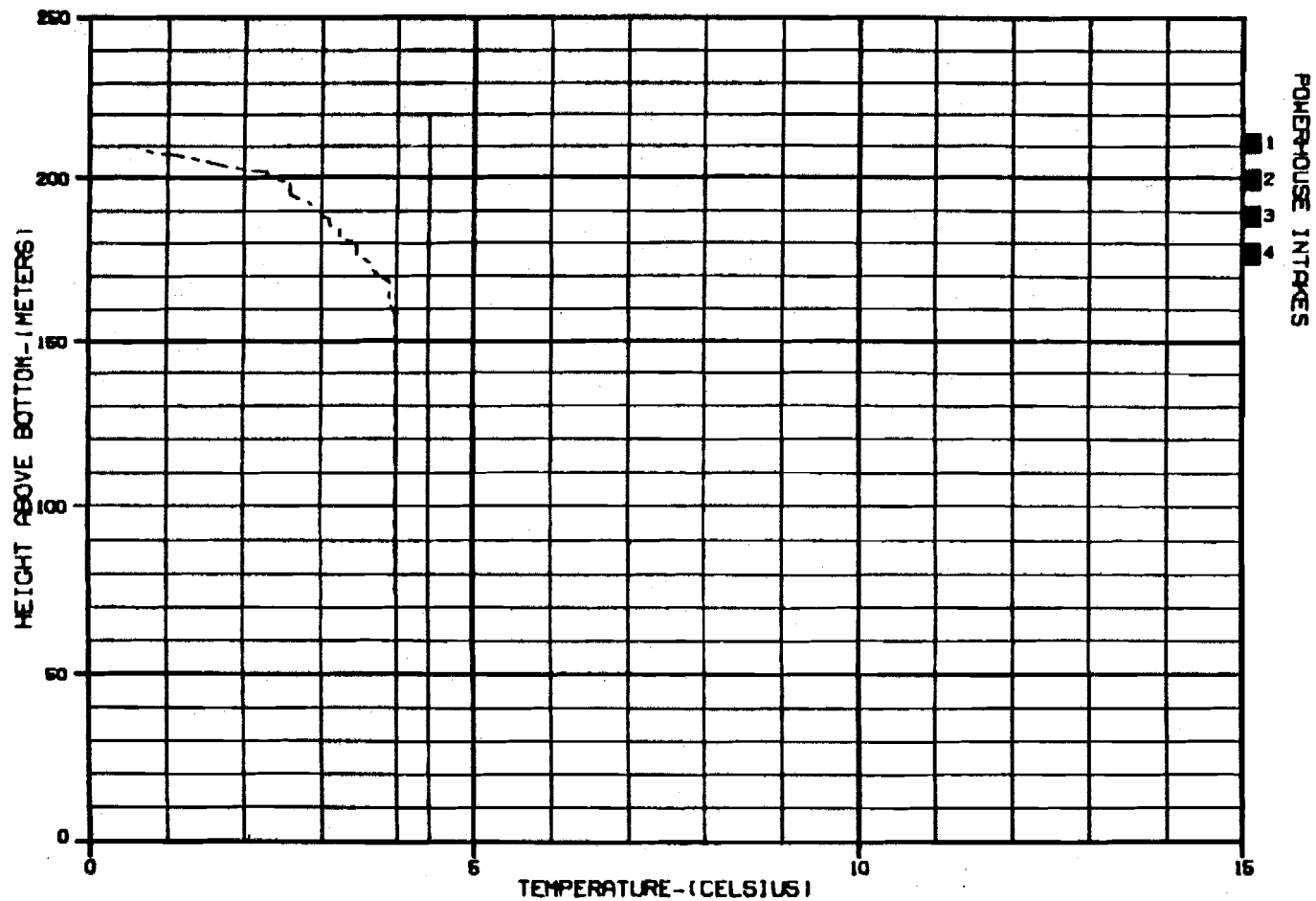
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DESIGN NO. 01

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

OWNER: ALASKA 8 JUN 81 48-000-01



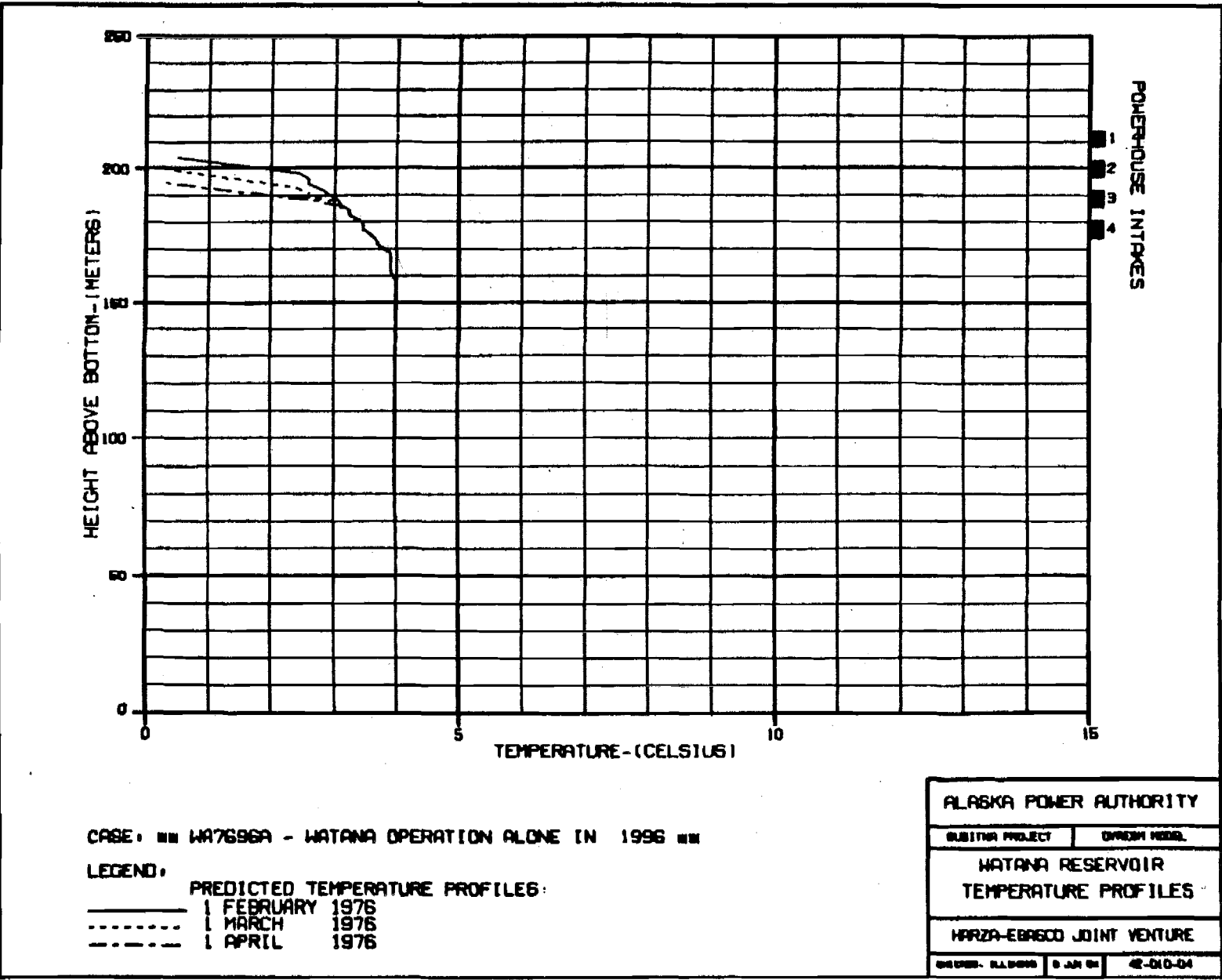
CASE: ■■ WAT7696A - WATANA OPERATION ALONE IN 1996 ■■

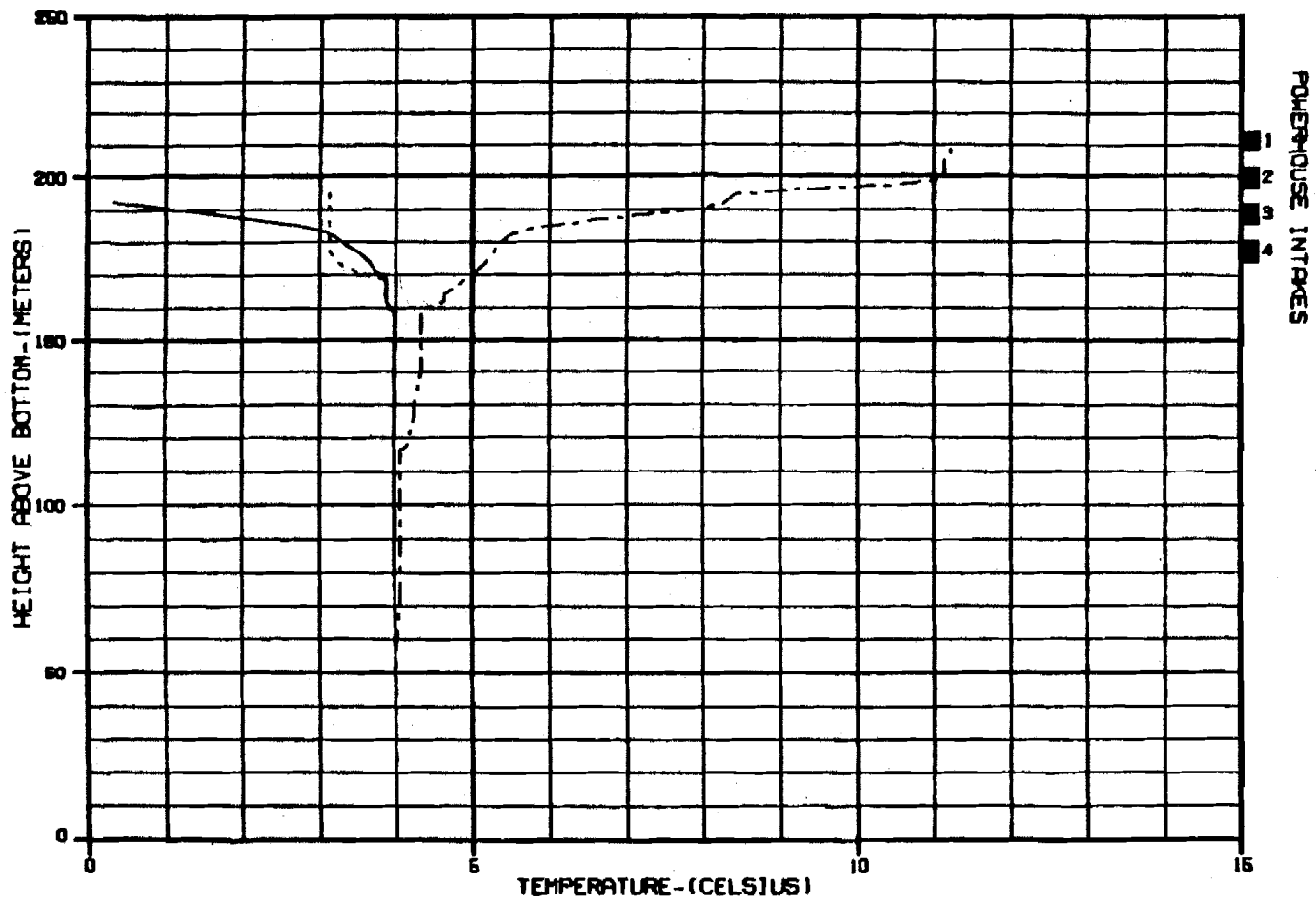
LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1975
- 1 DECEMBER 1975
- · - · - 1 JANUARY 1976

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	DIVISION MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EGASCO JOINT VENTURE		
DESIGNER: ALLIANCE	DATE: 8 JAN 84	42-010-04

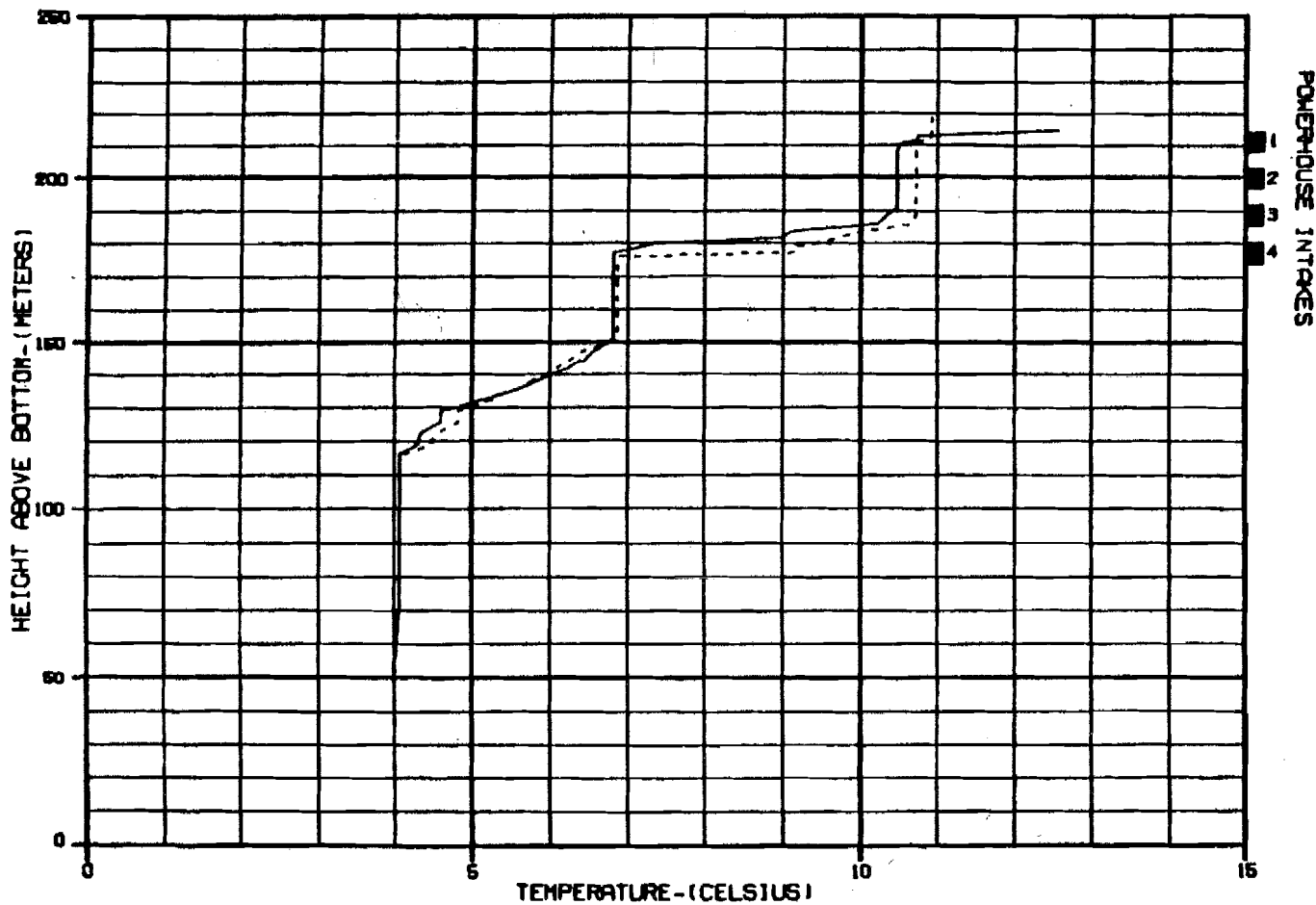




CASE: ■■ WA7896A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 MAY 1976
 - - - - - 1 JUNE 1976
 - · - · - 1 JULY 1976

ALASKA POWER AUTHORITY		
SUBITNA PROJECT	OVERSEAS MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
WORKING DRAWING	5 JAN 87	42-010-04



CASE: WAT7696A - WATANA OPERATION ALONE IN 1996 W/M

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- AUGUST 1976
- SEPTEMBER 1976
- OCTOBER 1976

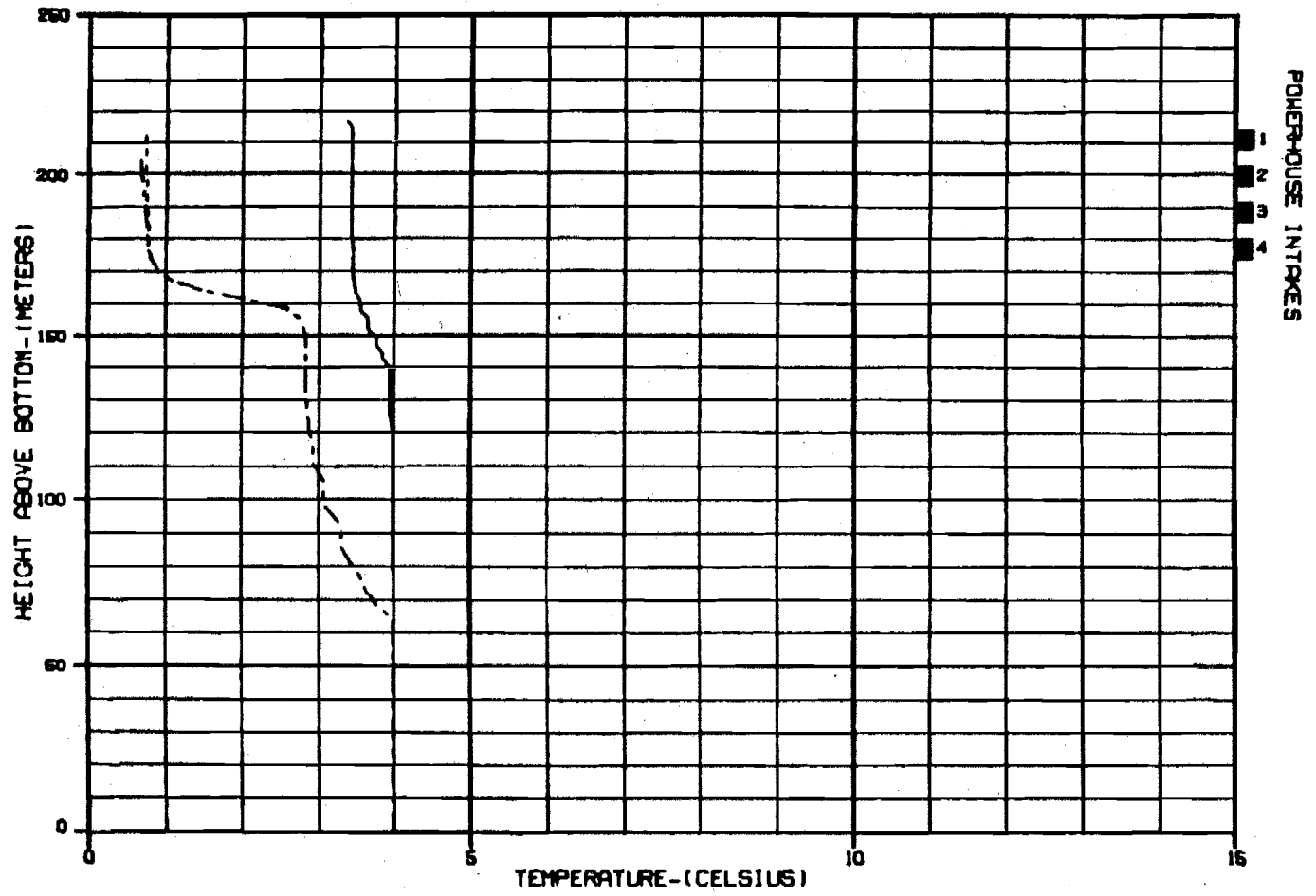
ALASKA POWER AUTHORITY

SUBMITTA PROJECT OTHER PROJ.

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

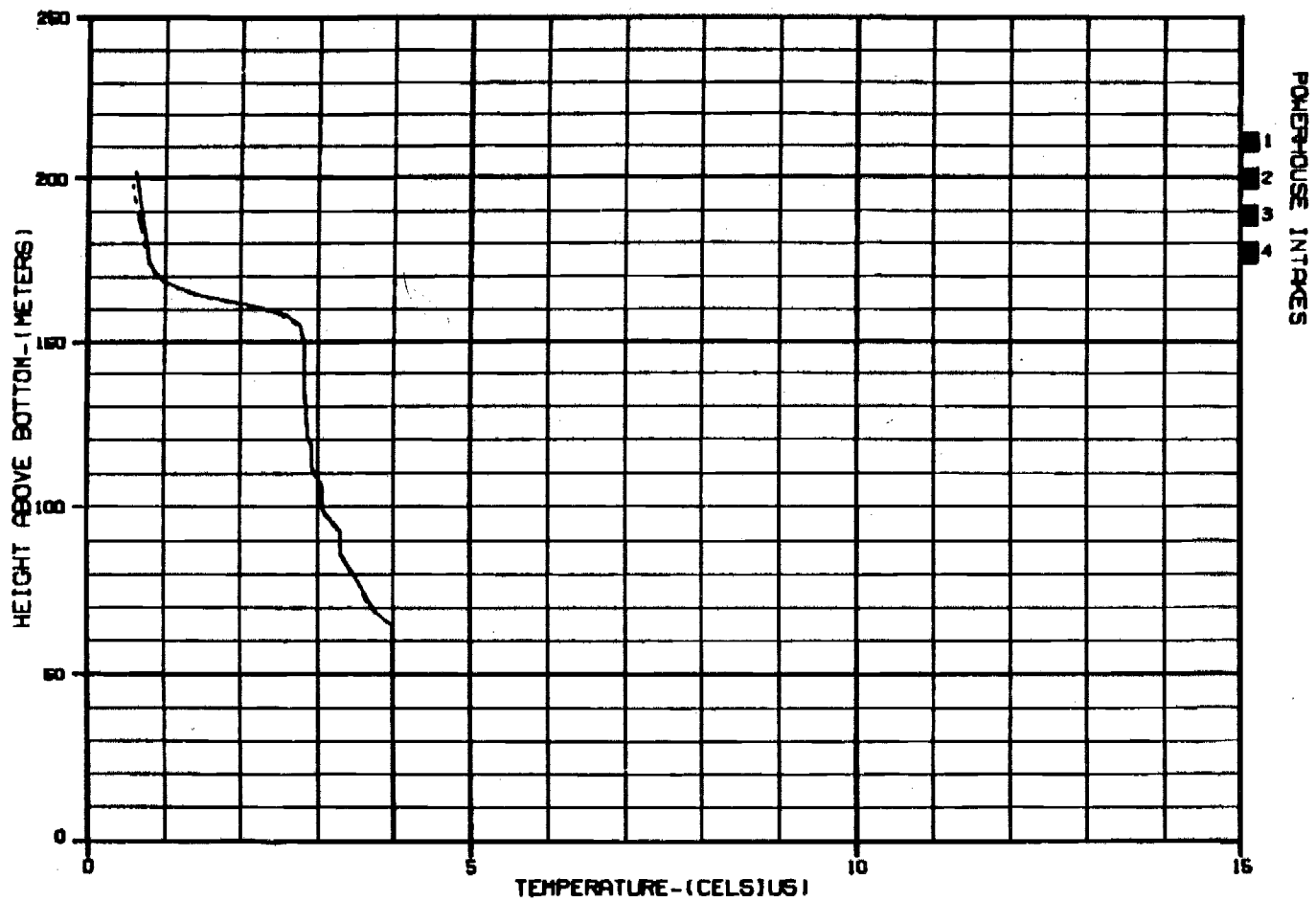
CHARGE: AL 9602 8 JAN 87 42-010-04



CASE: WA7696A - WATANA OPERATION ALONE IN 1996

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— 1 NOVEMBER 1976
 - - - - 1 DECEMBER 1976
 - · - · 1 JANUARY 1977

ALASKA POWER AUTHORITY	
DISTRIBUTION PROJECT	OPERATION MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HAZRA-EBASCO JOINT VENTURE	
DATE: 01-09-97	4E-010-04

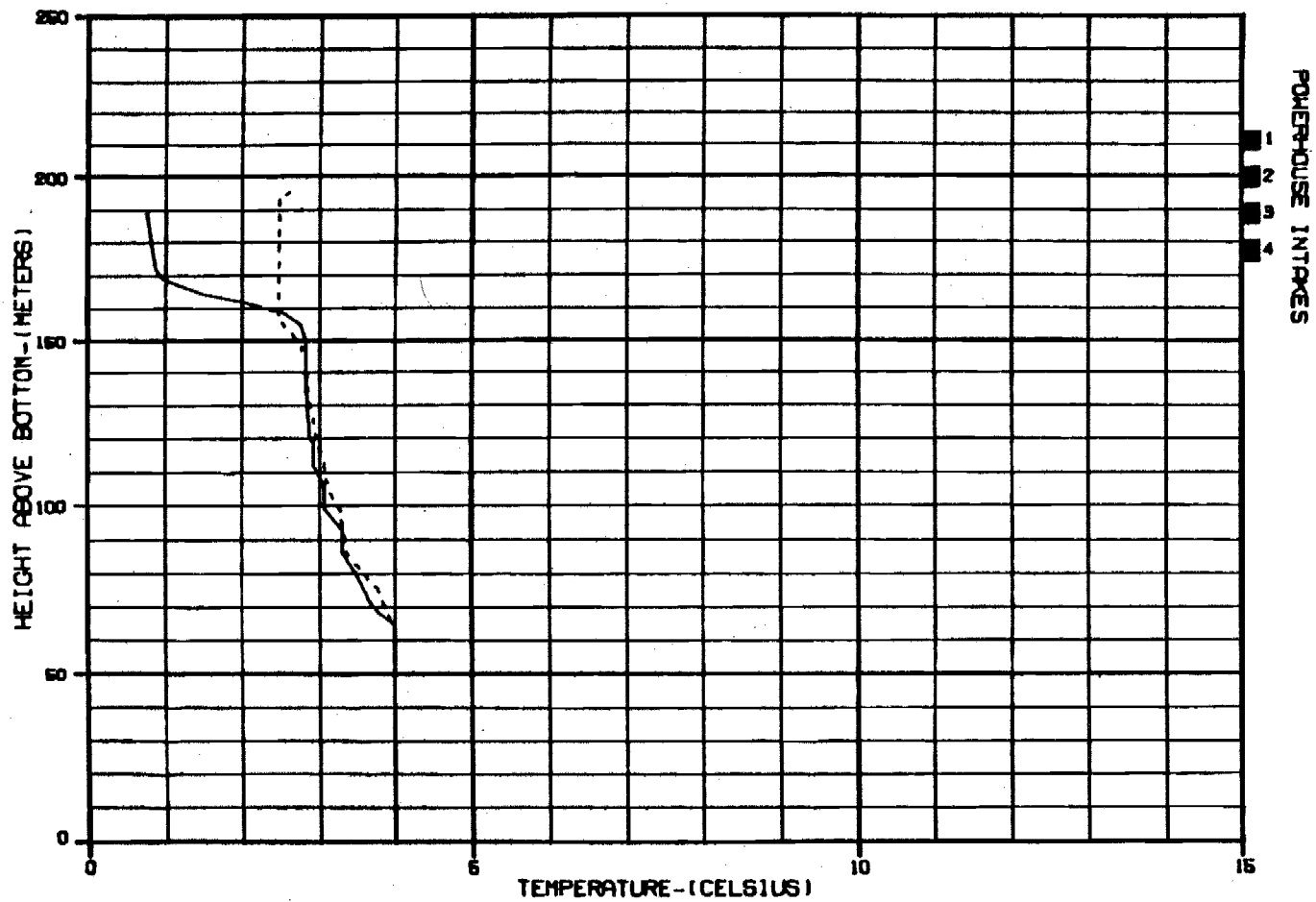


POWERHOUSE INTAKES

CASE: ■■ WA7696A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ | FEBRUARY 1977
 - - - - - | MARCH 1977
 | APRIL 1977

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	OPERATION MODEL	
WATANA RESERVOIR		
TEMPERATURE PROFILES		
WARZA-EBRSCO JOINT VENTURE		
DESIGN: S.A. BROWN	8 JAN 81	42-010-04



CASE: ■■ WA7696A - WATANA OPERATION ALONE IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— | MAY 1977
 - - - - | JUNE 1977
 - · - · - | JULY 1977

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OWNER MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

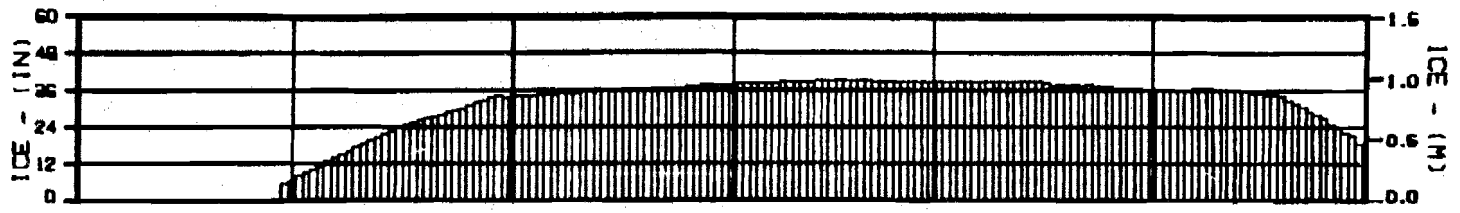
HARZA-EBASCO JOINT VENTURE

DESIGN: S.L.P.000

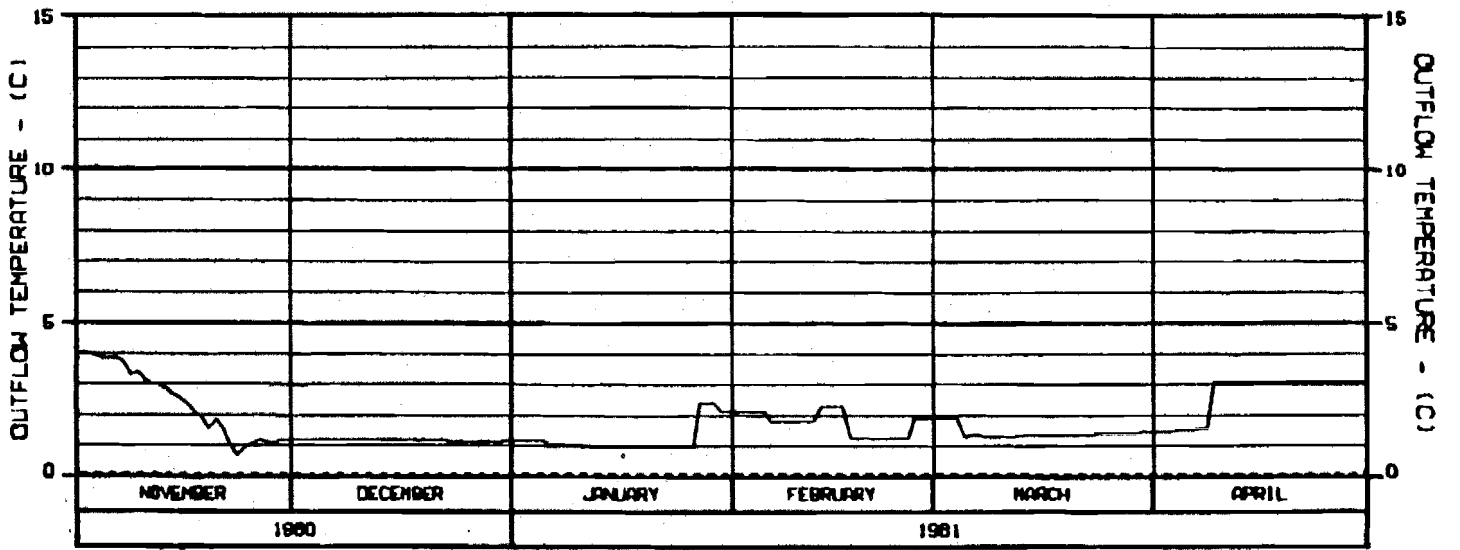
9 JAN 87

42-010-04

EXHIBIT T



INTAKE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	CONE VALVE	SPILLWAY
	██████████	██████████	██████████	██████████		

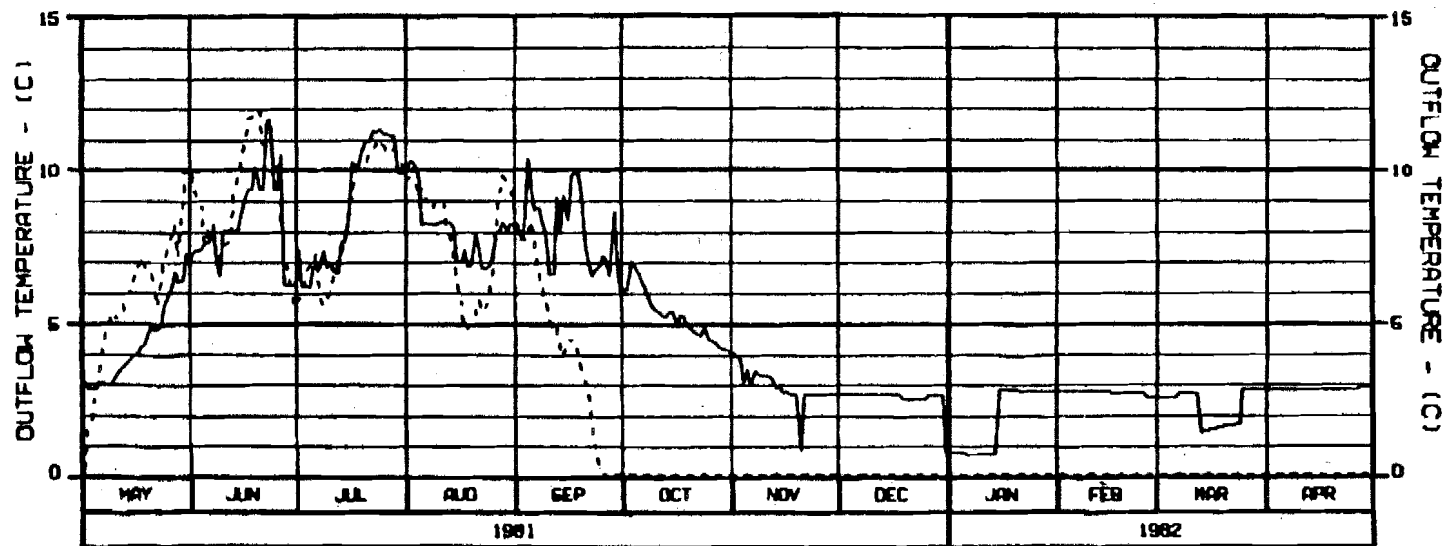
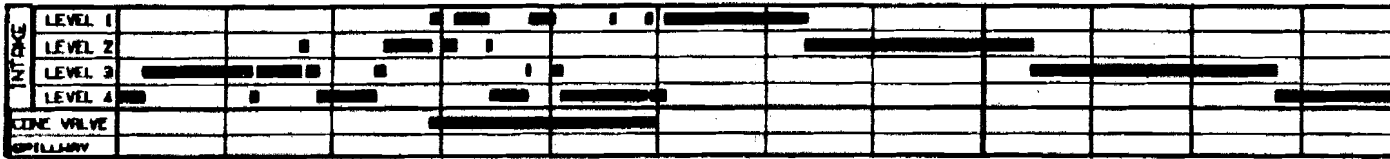
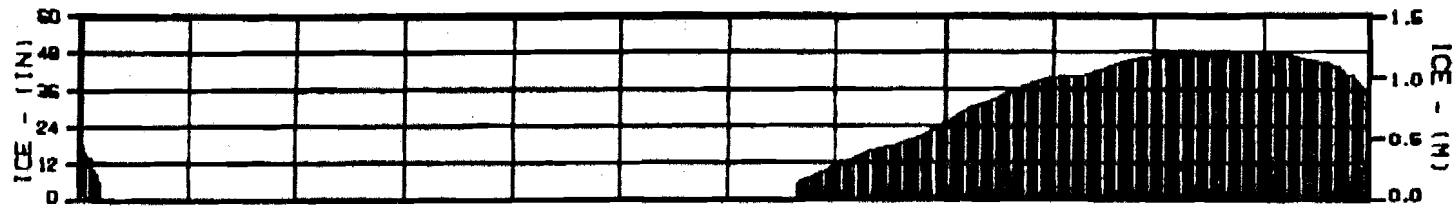


LEGEND: CASE: ■■ H98102100E - WATANA OPERATION IN 1986 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

ALASKA POWER AUTHORITY	
SUBITNA PROJECT	OPERATION MODEL
WATANA RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH	
HARZA-EBRACCO JOINT VENTURE	
ENCLOS. 5-110070	9 JAN 81 40-010-01



LEGEND, CASE: HA 110219CC - NATANA OPERATION IN 1996 ##

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

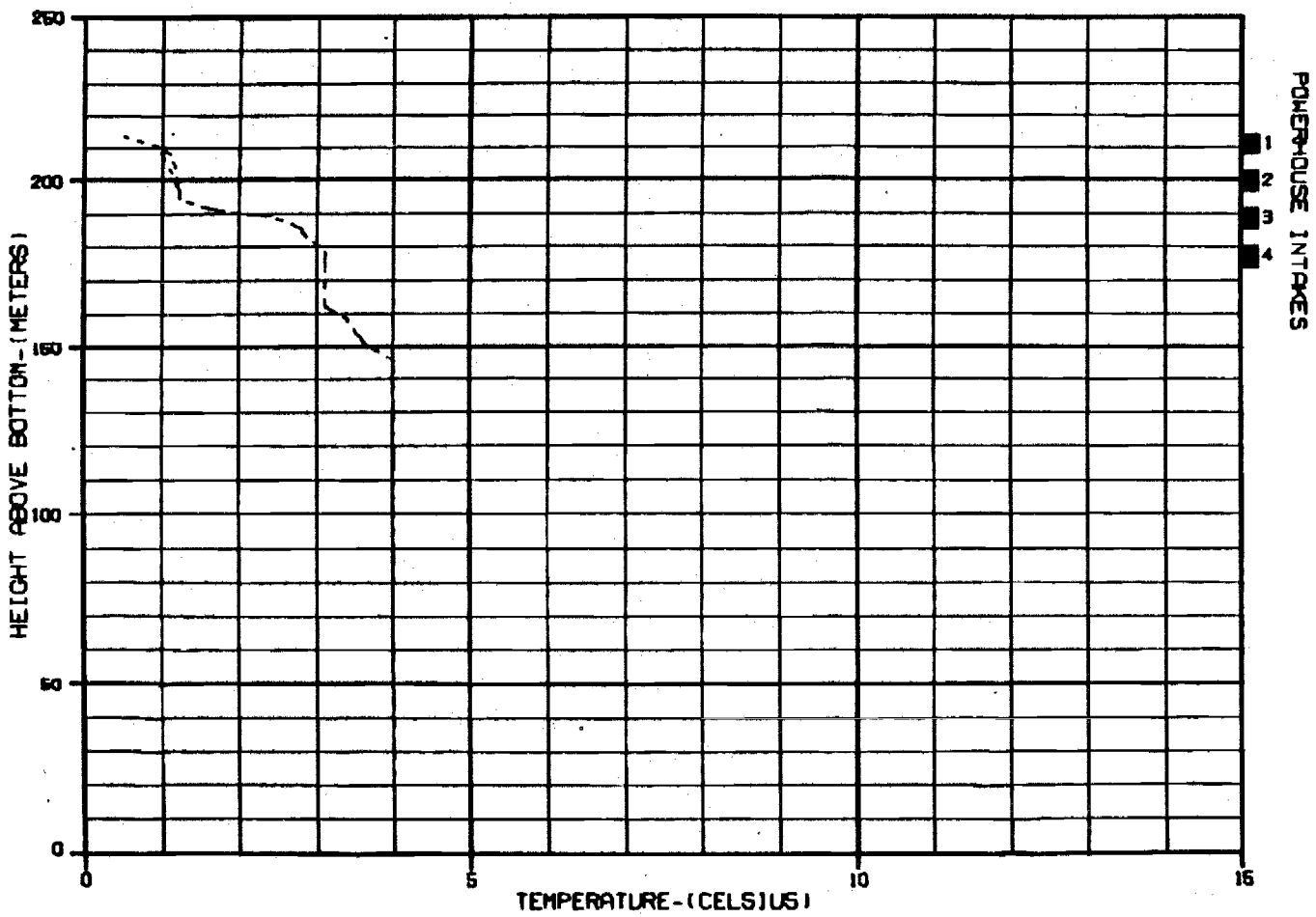
ALASKA POWER AUTHORITY

OUTFLOW PROJECT DYNESH MODEL

NATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBR600 JOINT VENTURE

TRACER - ELBERTS 8 JAN 82 20-000-04



CASE: ■■ WAB11B2196E - WATANA OPERATION IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1980
- 1 DECEMBER 1980
- 1 JANUARY 1981

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

DIAPHRM MODEL

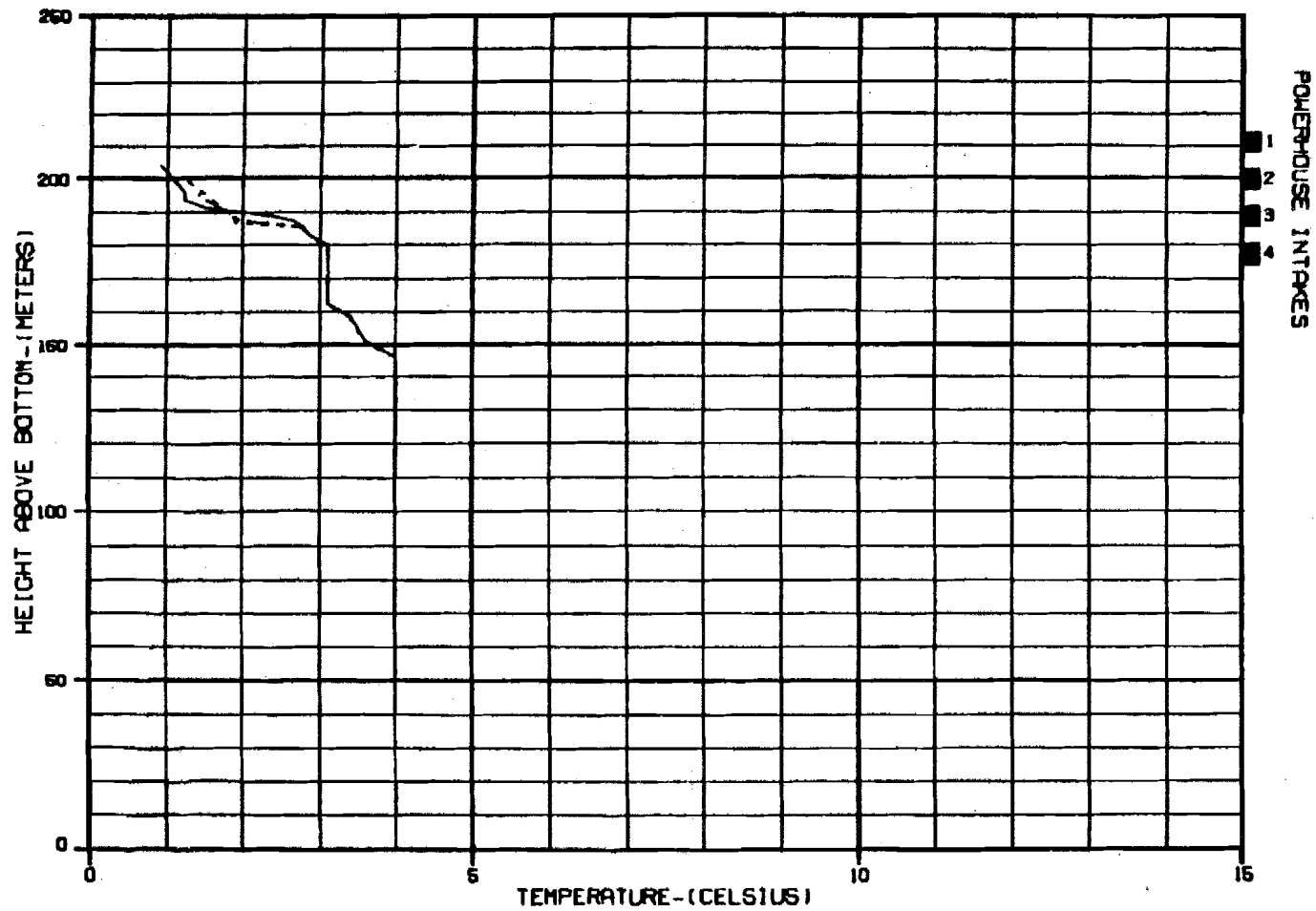
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRECO JOINT VENTURE

CHANGES: ALL-DRAW

© JAN 81

4E-DIG-04



CASE: ■■ WAB1182196E - WATANA OPERATION IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | FEBRUARY 1981
 - - - | MARCH 1981
 - · - · | APRIL 1981

ALASKA POWER AUTHORITY

WATANA PROJECT

OPERATION MODEL

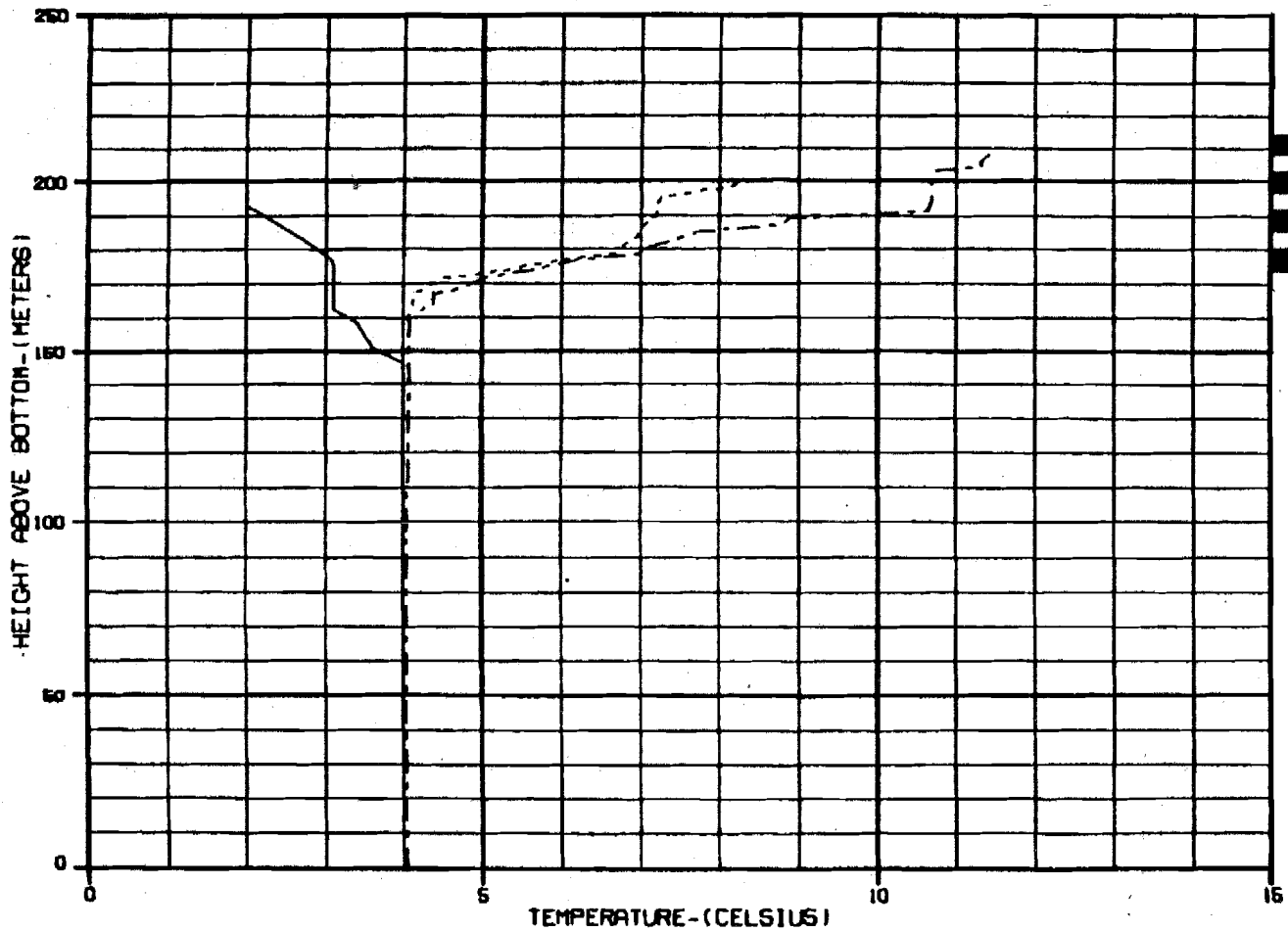
WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHUCKER, S.L.P. 88

8 JAN 84

42-D10-04



CASE: ■■ WAB11B2196E - WATANA OPERATION IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— 1 MAY 1981
 - - - - - 1 JUNE 1981
 - · - · - 1 JULY 1981

ALASKA POWER AUTHORITY

WATANA PROJECT

DYKES MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

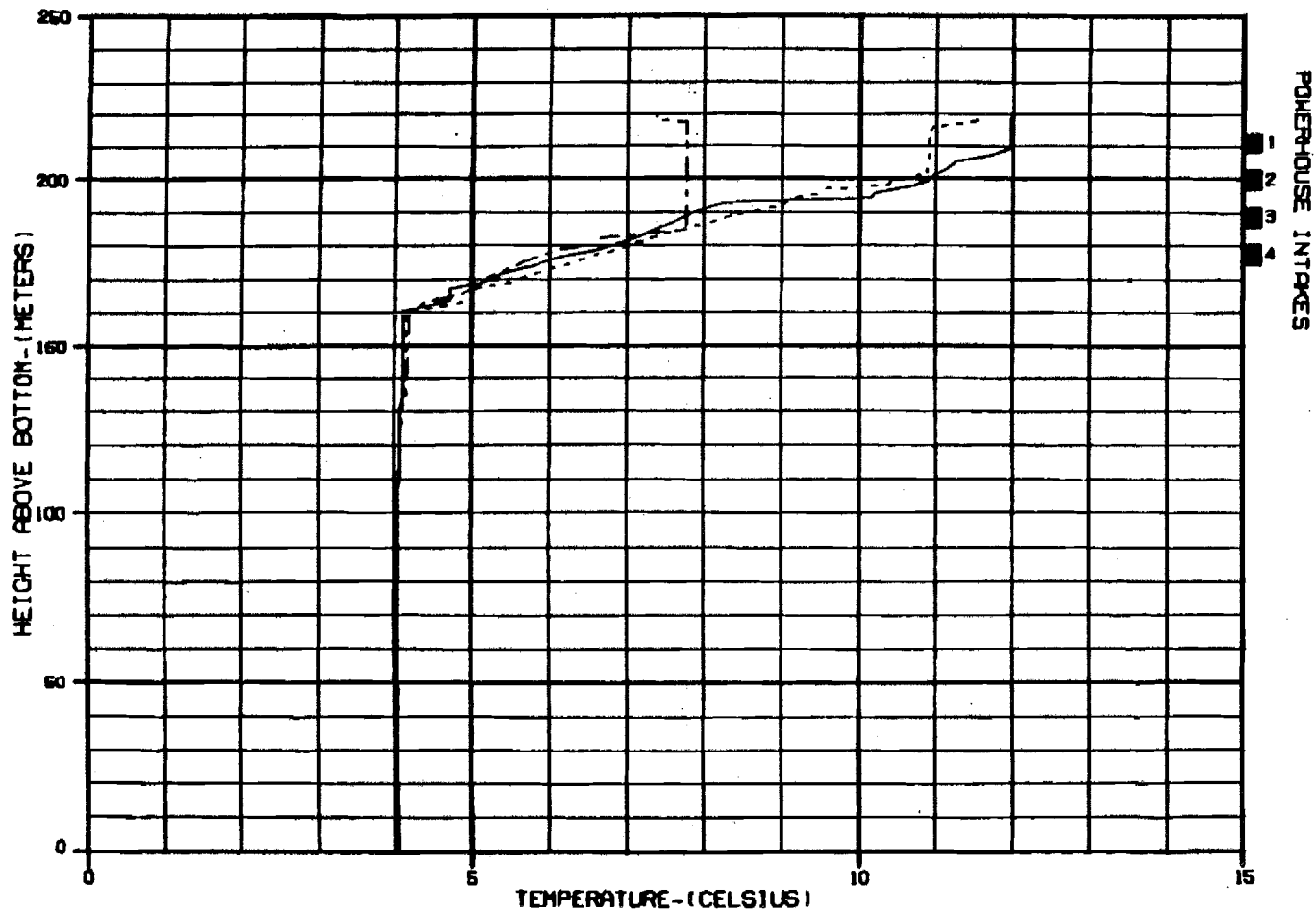
WARZA-EBRSCO JOINT VENTURE

CHGCRS - 8-8-88

8 JAN 89

42-010-04

POWERHOUSE INTAKES



CASE: WAB1182196E - WATANA OPERATION IN 1996

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | AUGUST 1981
 - - - | SEPTEMBER 1981
 - . - . | OCTOBER 1981

ALASKA POWER AUTHORITY

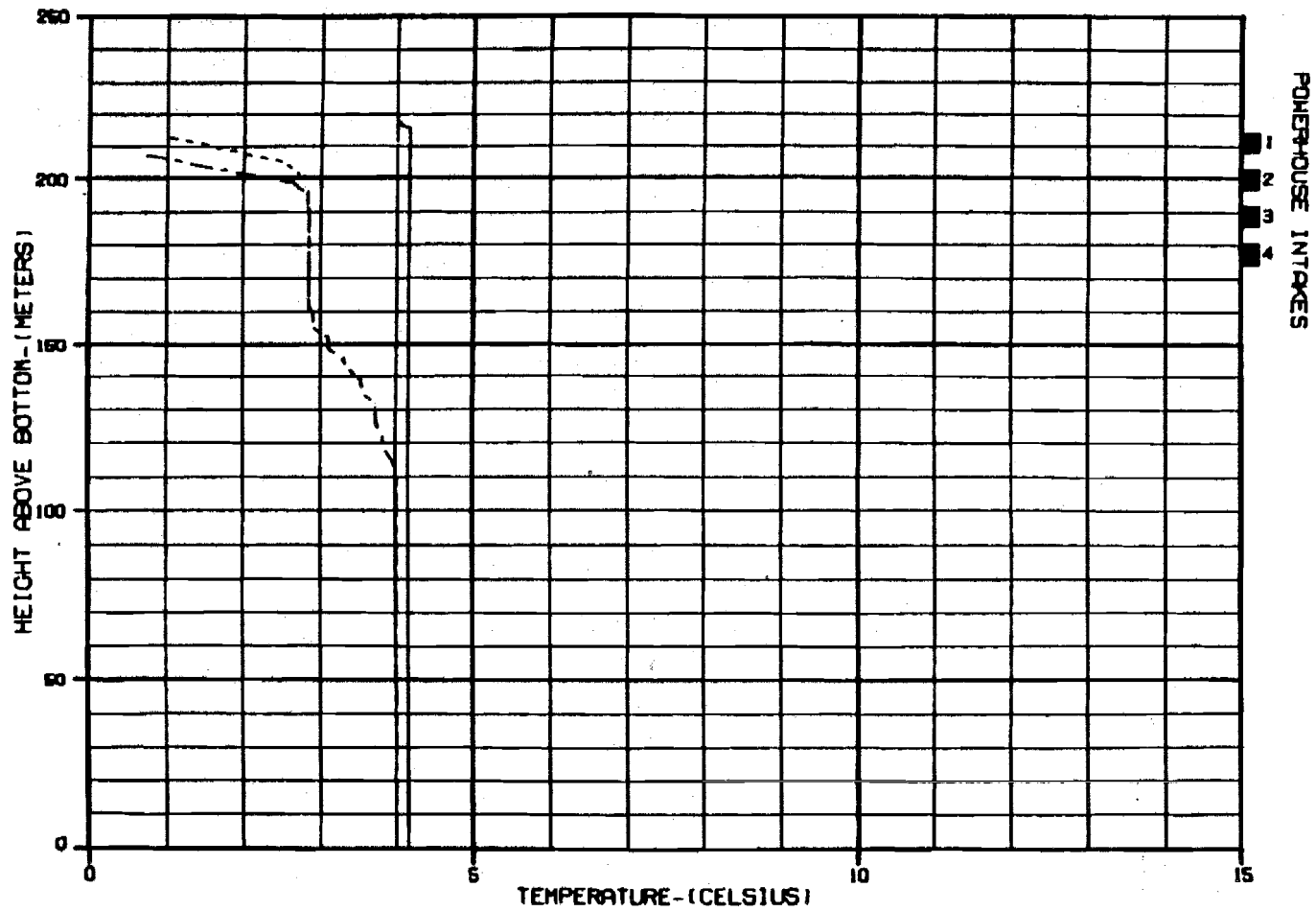
WATANA PROJECT

OPERATION MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBRSCO JOINT VENTURE

DESIGNED BY: J. J. JONES | 9 JAN 81 | 42-010-04



CASE: WAB1182196E - WATANA OPERATION IN 1996

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 NOVEMBER 1981
 - - - 1 DECEMBER 1981
 - · - · 1 JANUARY 1982

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OPERON MODEL

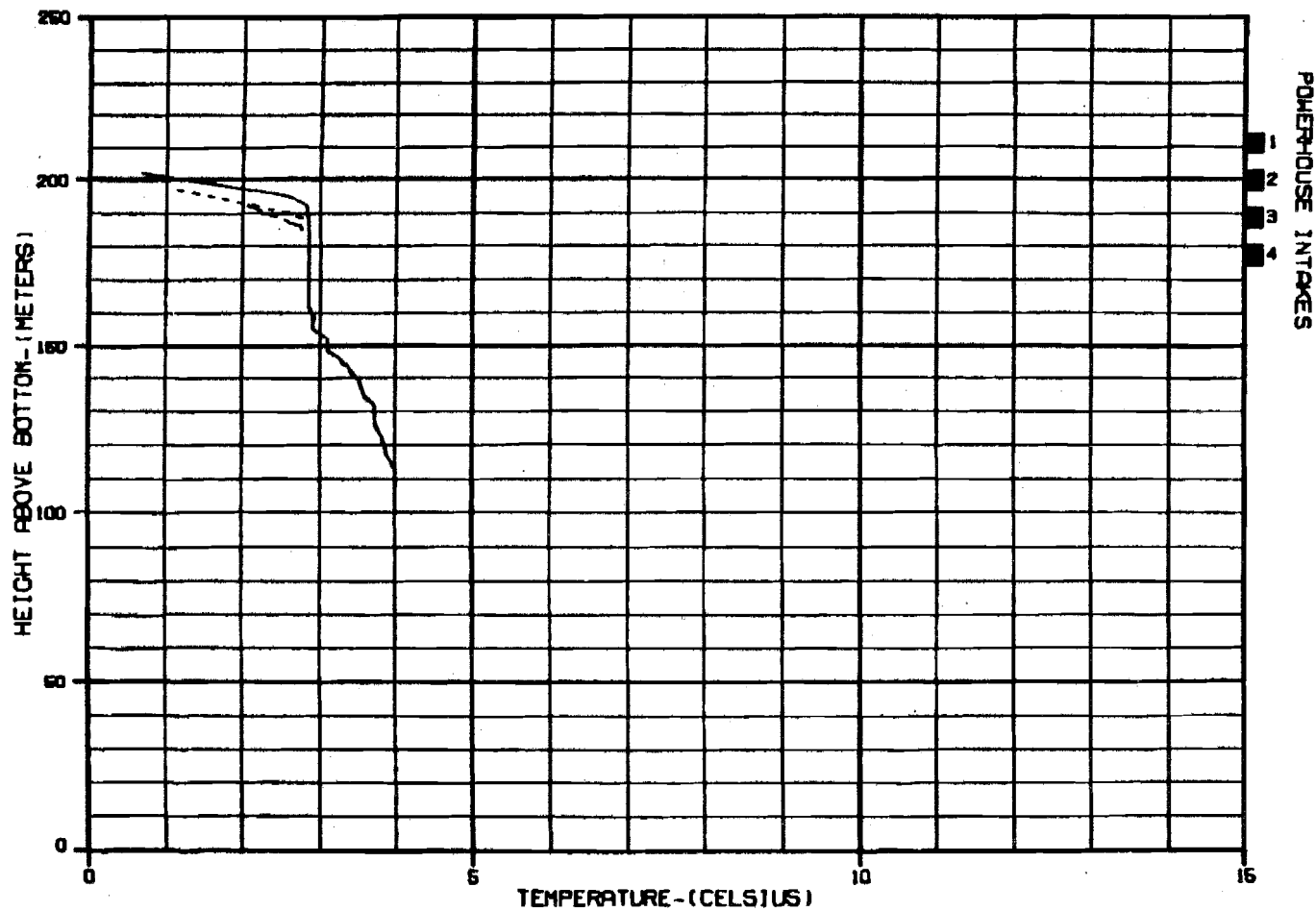
WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

OWNER: ALASKA

DATE: 01/81

42-010-04



CASE: WAB1182196E - WATANA OPERATION IN 1996

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— 1 FEBRUARY 1982
 - - - - - 1 MARCH 1982
 - · - · - 1 APRIL 1982

ALASKA POWER AUTHORITY

WATANA PROJECT

DYNEM MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

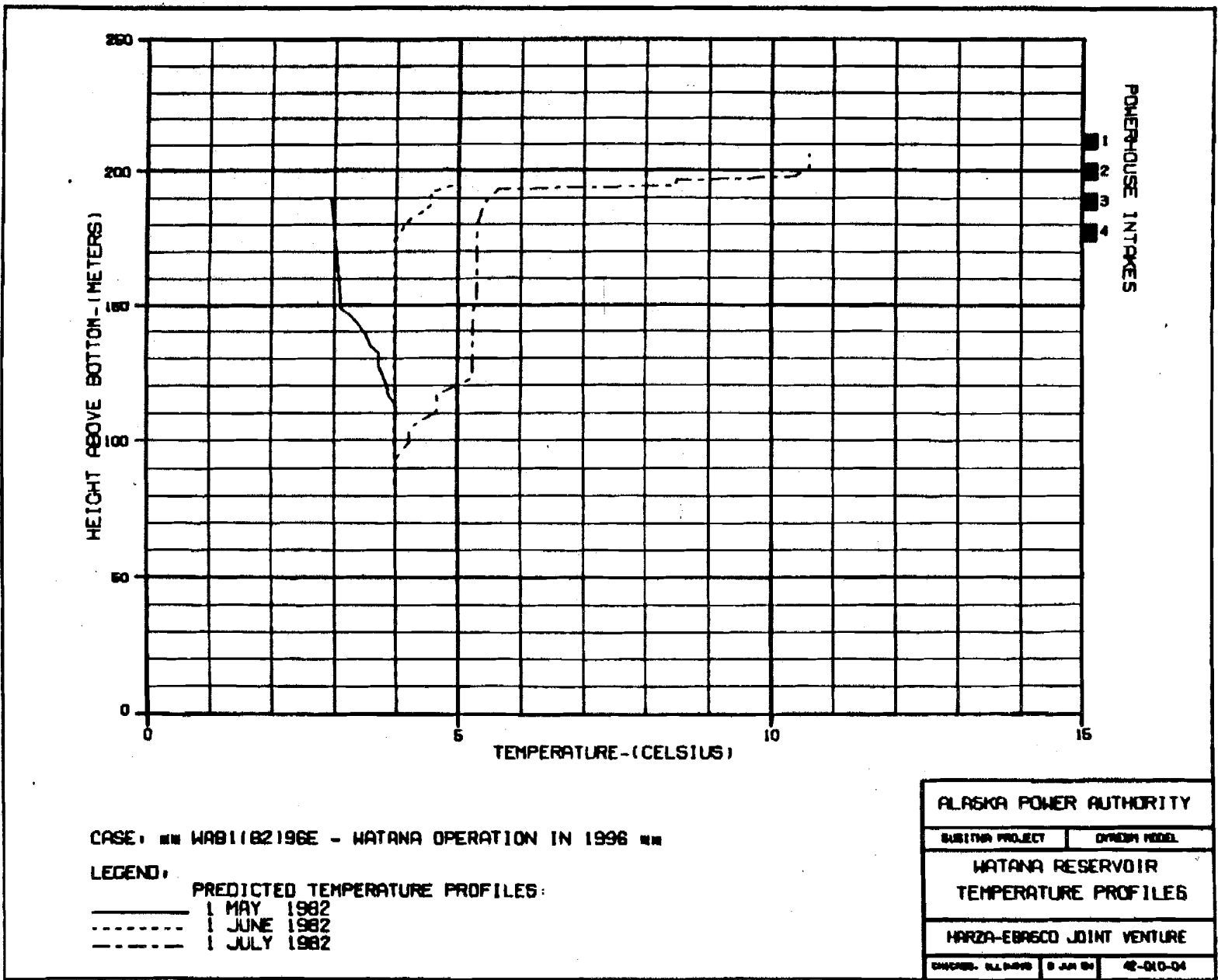
WARZA-EBAGCO JOINT VENTURE

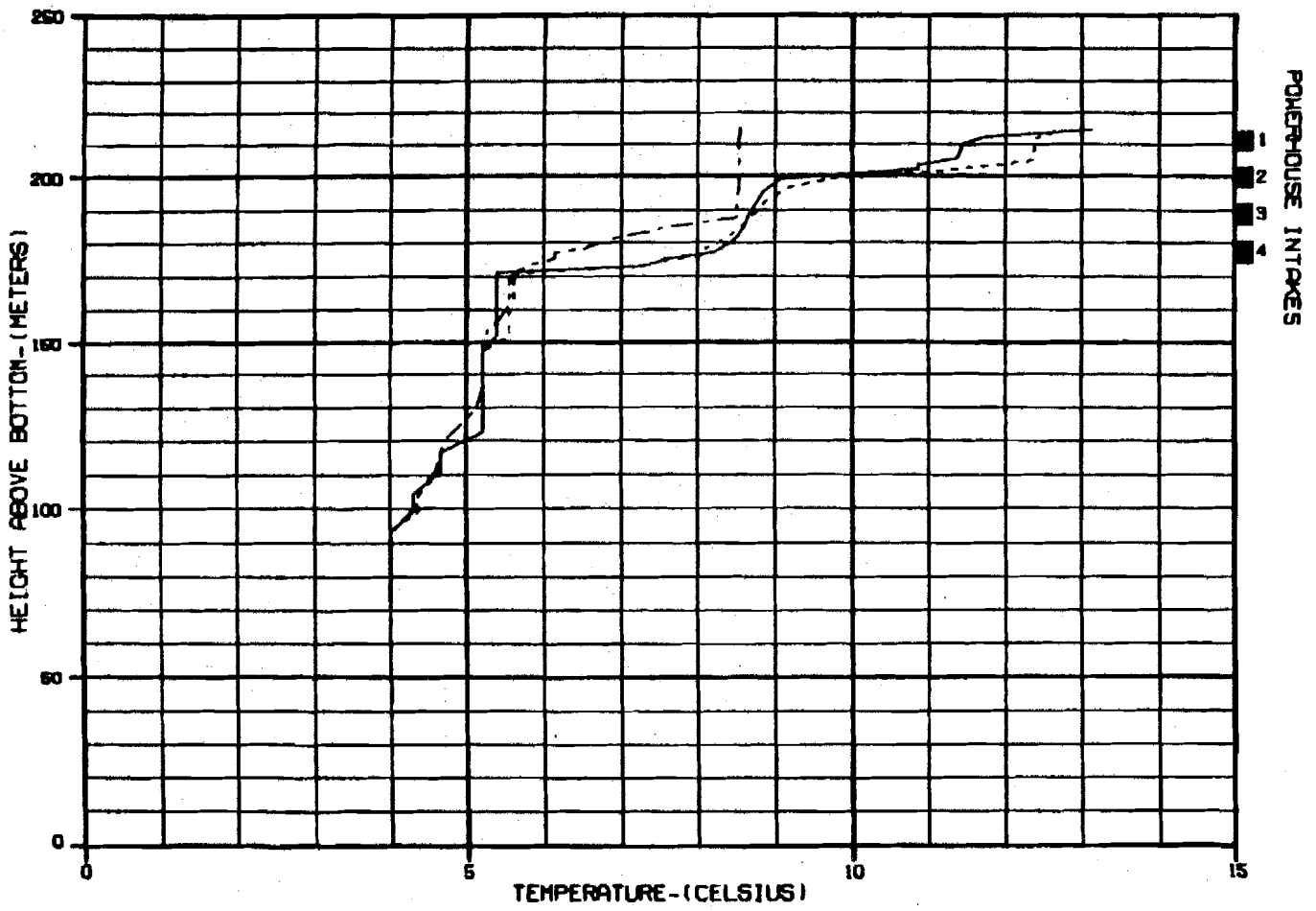
ORDER: 811888

8 JAN 84

42-010-04

EXHIBIT U

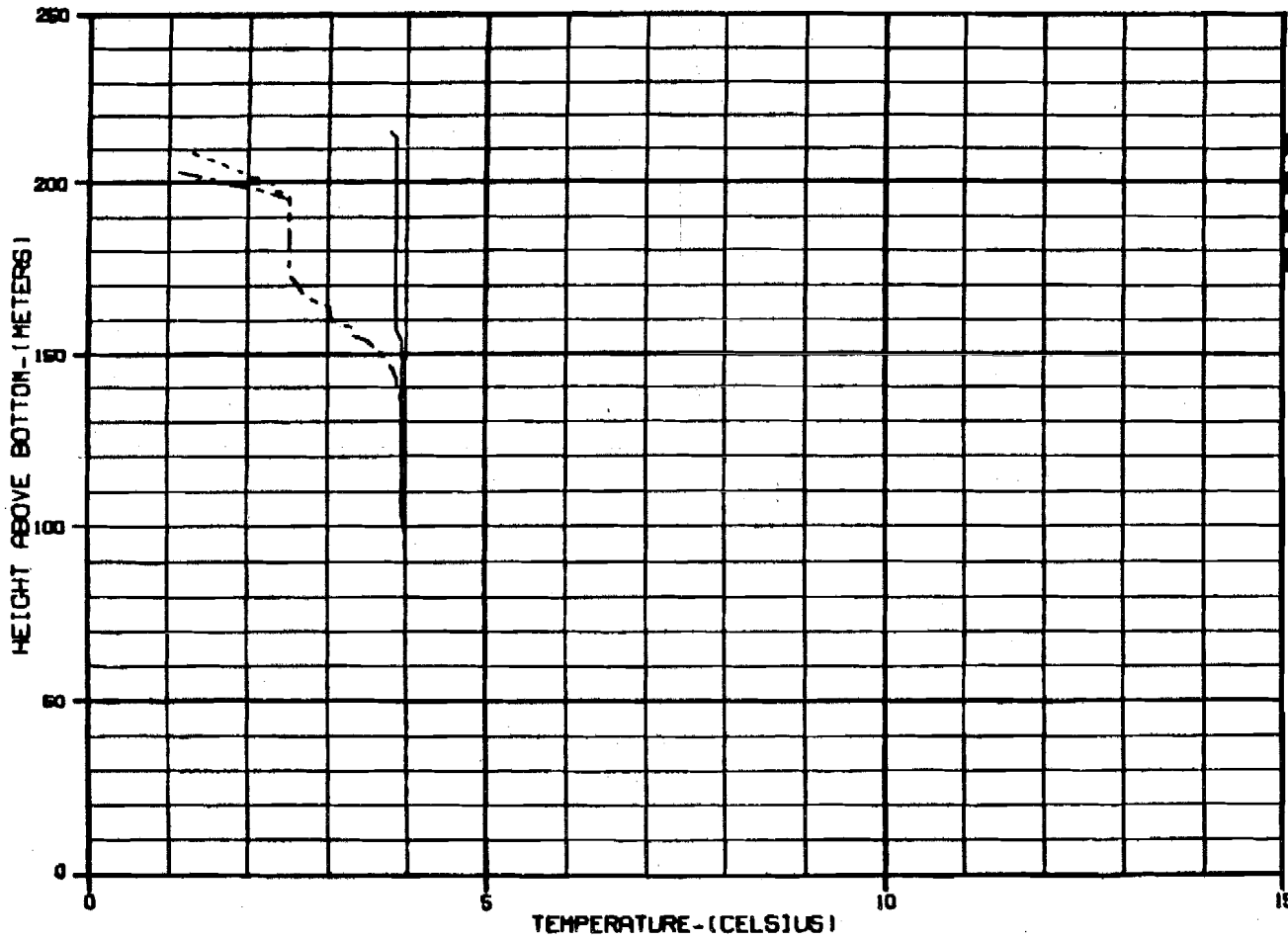




CASE: ■■ WAB1182196E - WATANA OPERATION IN 1986 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | AUGUST 1982
 | SEPTEMBER 1982
 - - - - | OCTOBER 1982

ALASKA POWER AUTHORITY	
SUBMITTA PROJECT	OPERON MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
PROJECT: WAB1182196E	DATE: 01-01-84



CASE: WAB1182196E - WATANA OPERATION IN 1996

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 NOVEMBER 1982
 - - - - - 1 DECEMBER 1982
 - . - . - 1 JANUARY 1983

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OWNER MODEL

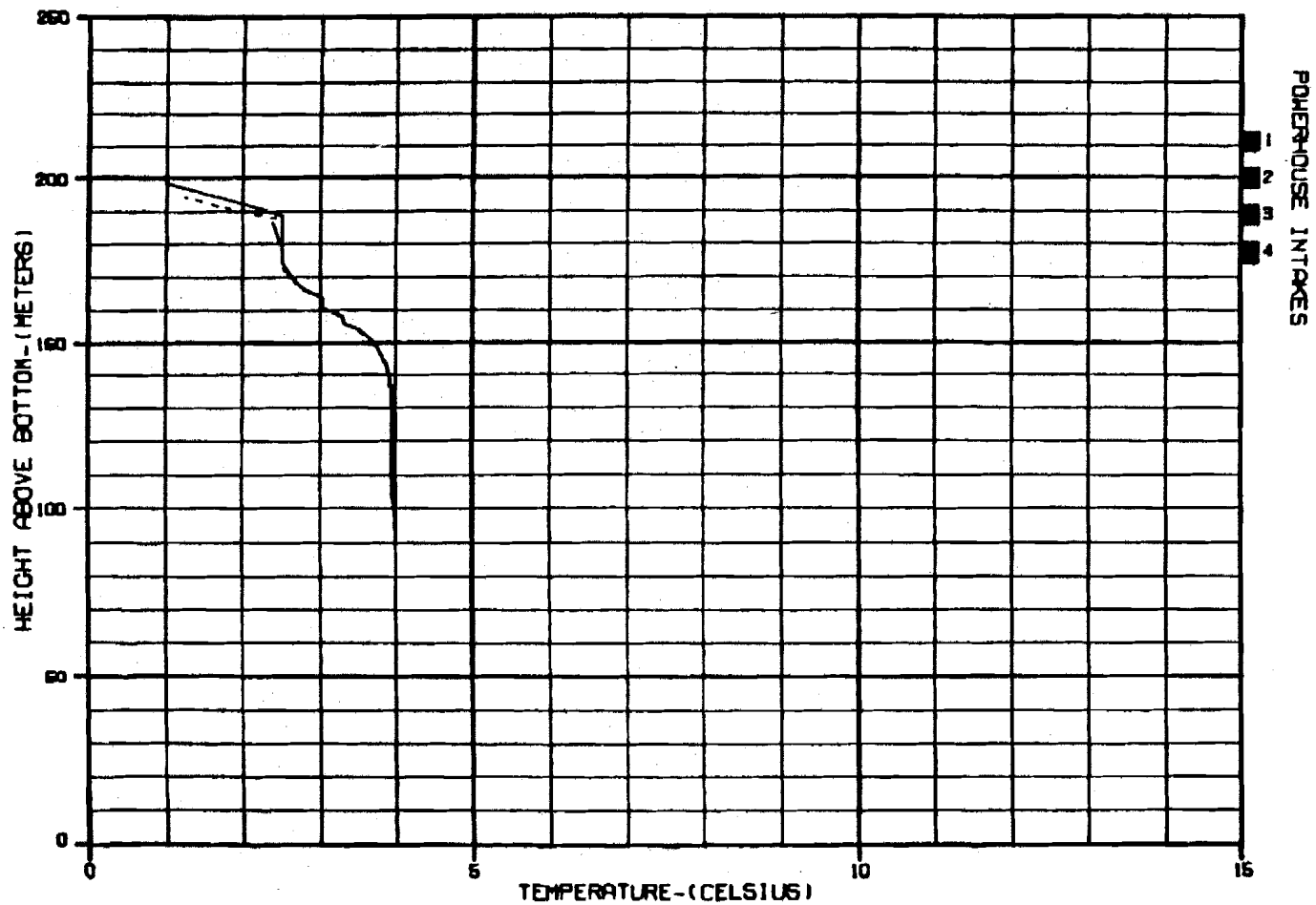
WATANA RESERVOIR
TEMPERATURE PROFILES

HRZA-EBASCO JOINT VENTURE

ORDER: 11-0000

9 JAN 83

42-010-04



CASE: ■■ WAB1102196E - WATANA OPERATION IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | FEBRUARY 1983
- | MARCH 1983
- | APRIL 1983

ALASKA POWER AUTHORITY

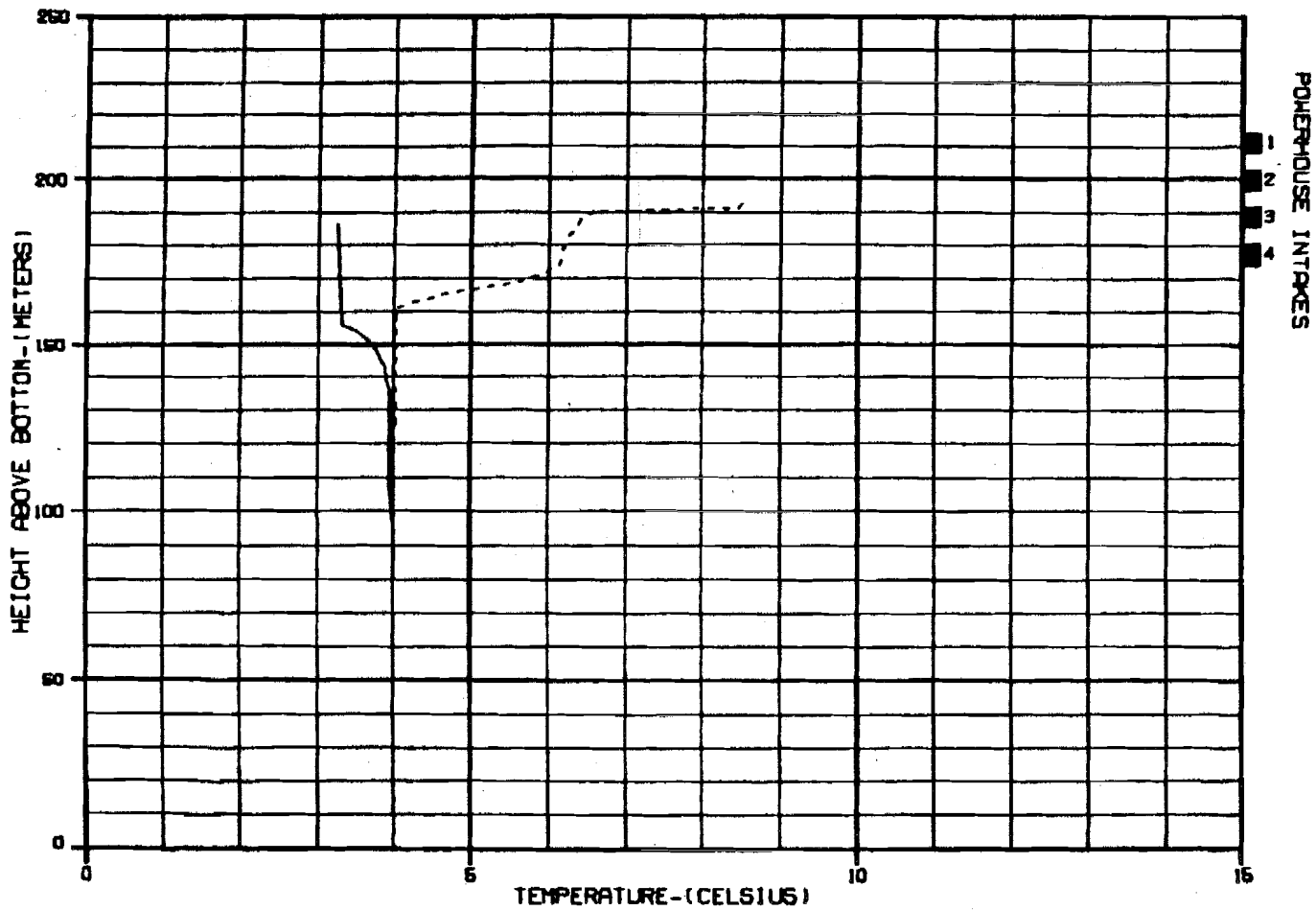
SUBTINA PROJECT

DYKES MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

ENCLOS. ALL PAGES 8 JAN 84 010-04



CASE: ■■ WAB1182196E - WATANA OPERATION IN 1996 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— MAY 1993
 - - - JUNE 1993

ALASKA POWER AUTHORITY

WATANA PROJECT

DYNAMIC MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

WARZA-EBRSCO JOINT VENTURE

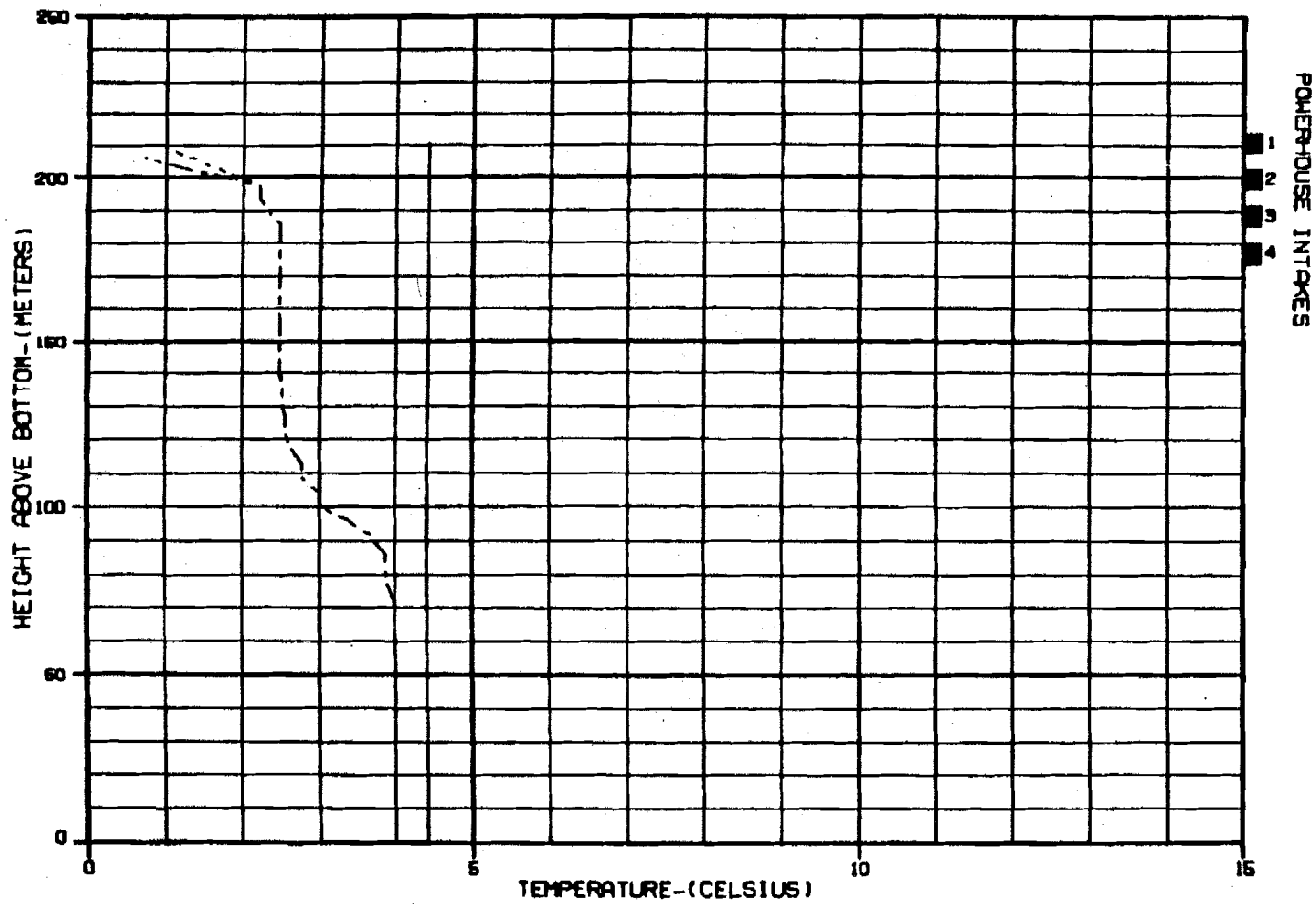
DATE: 11/19/96

1 JAN 97

4E-010-04

WATANA OPERATING
2001 Energy Demands

EXHIBIT V



CASE: WA7101A - WATANA OPERATION ALONE IN 2001

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 NOVEMBER 1970
 - - - - - 1 DECEMBER 1970
 - · - · - 1 JANUARY 1971

ALASKA POWER AUTHORITY

SUBITNA PROJECT

OWNER'S RECORD

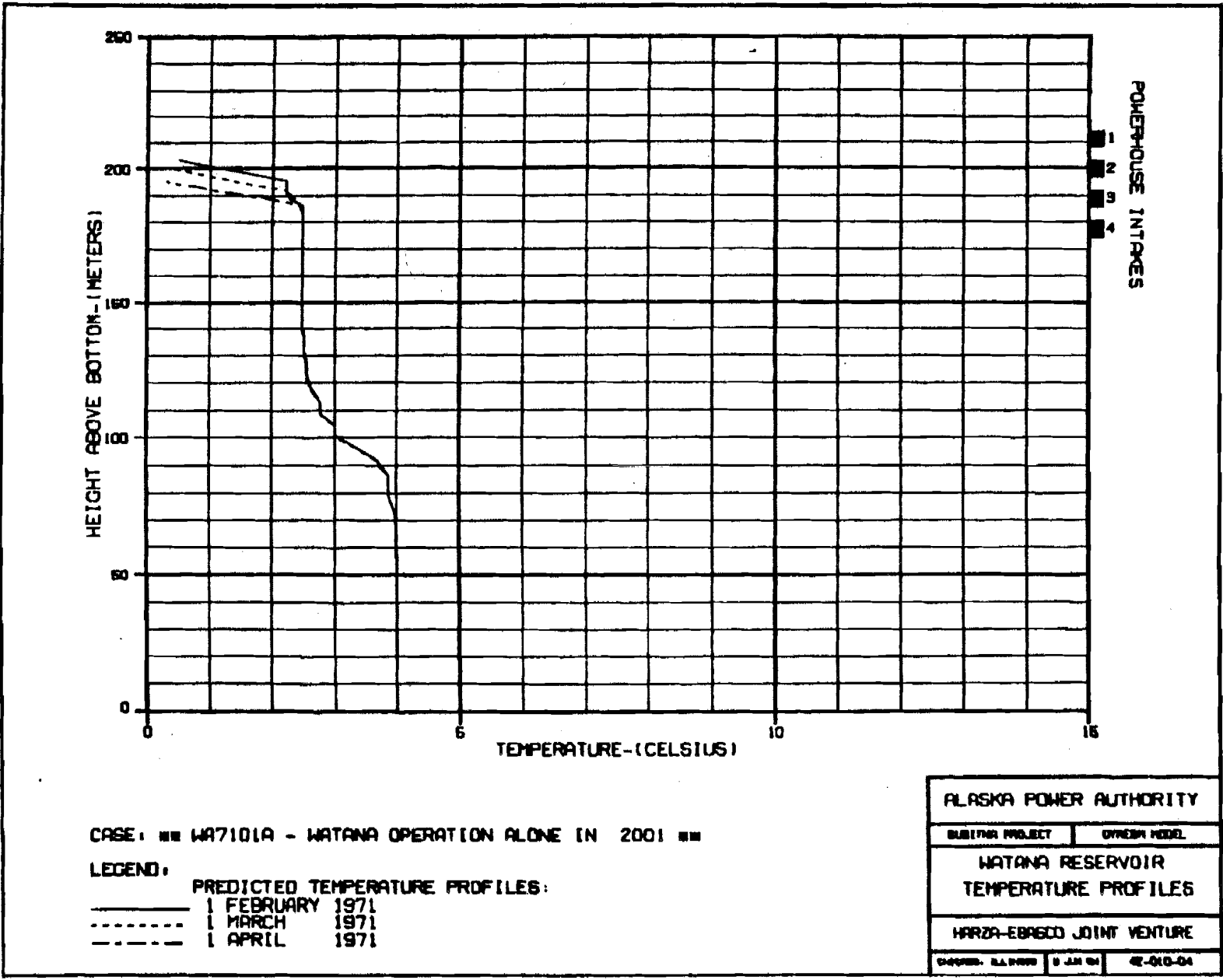
WATANA RESERVOIR
TEMPERATURE PROFILES

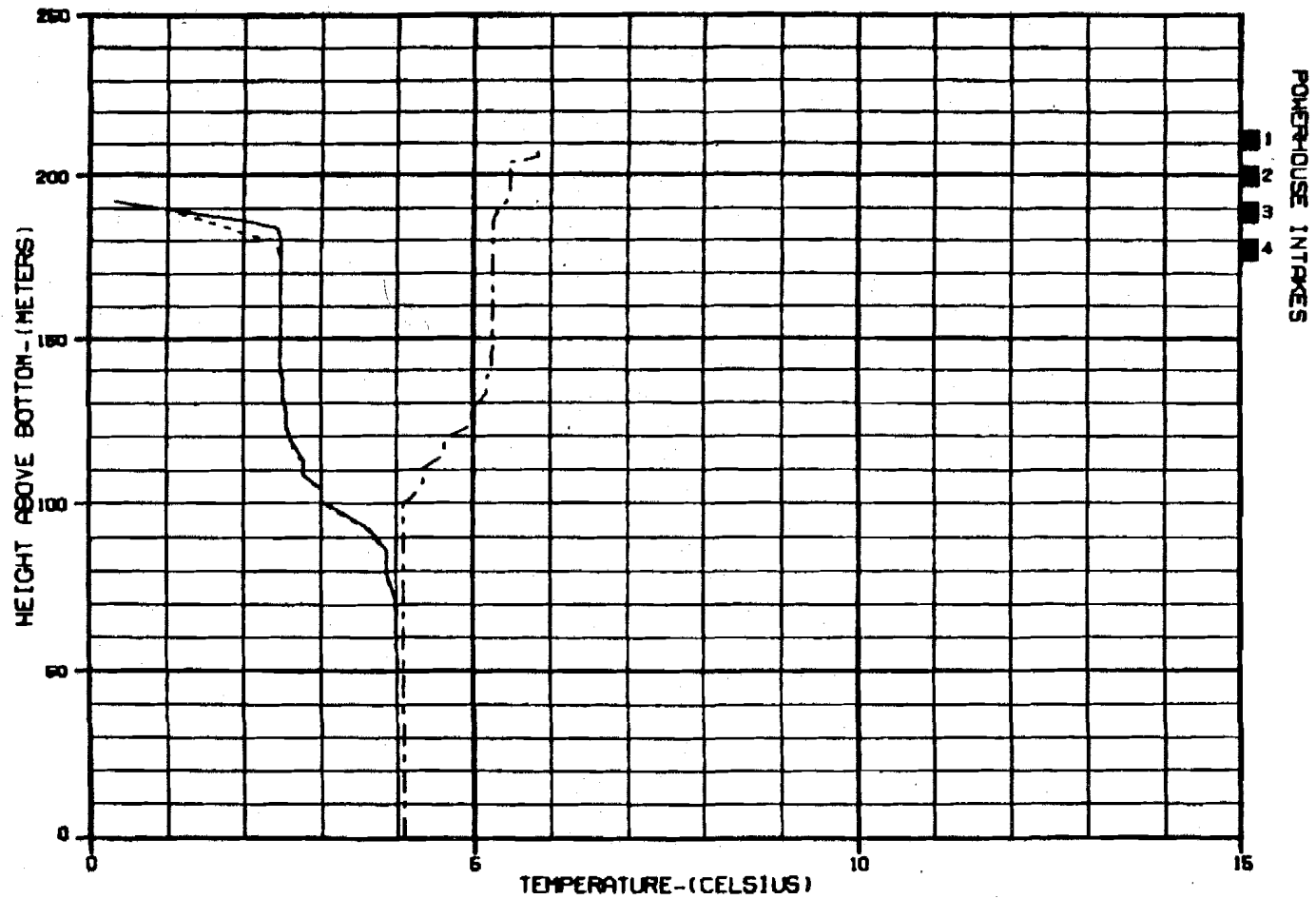
WARZA-EBASCO JOINT VENTURE

CHANGES: ALL SHEETS

8 JUN 81

42-010-04





CASE: ■■ WA7101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— 1 MAY 1971
 - - - - 1 JUNE 1971
 ······ 1 JULY 1971

ALASKA POWER AUTHORITY

WATANA PROJECT

WATANA MODEL

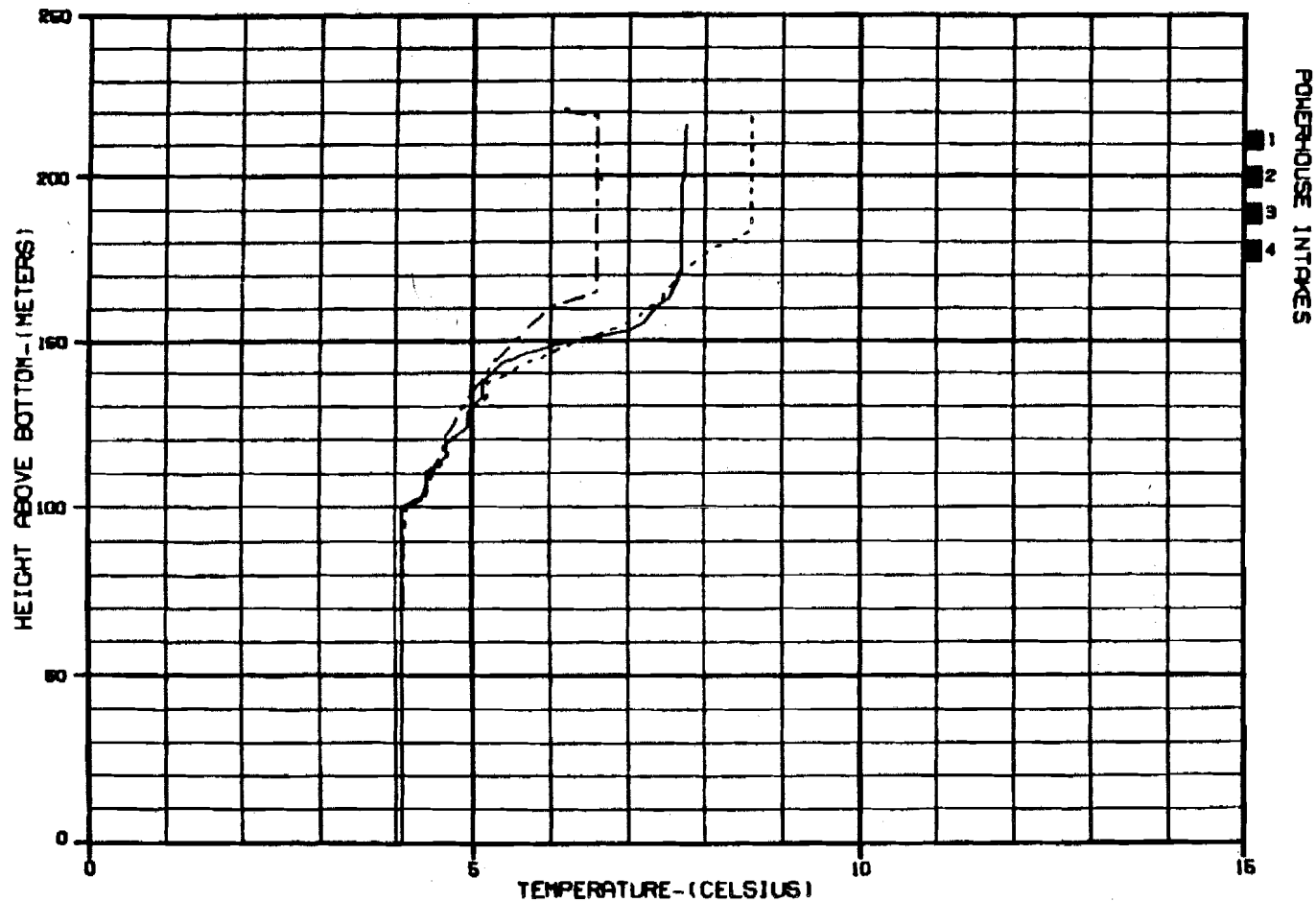
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

ENGINEER: B.L. BROWN

5 JAN 81

4E-010-04

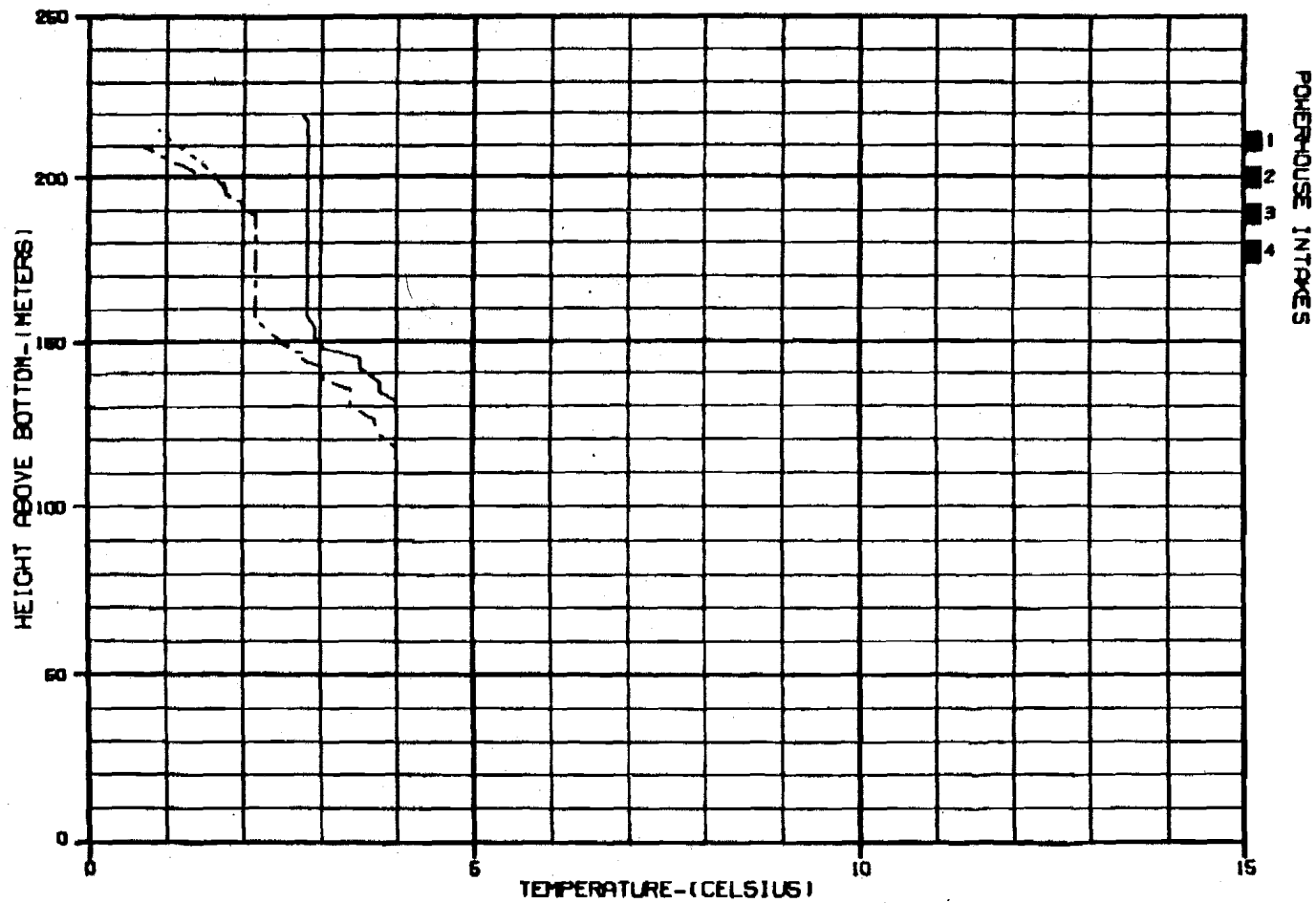


CASE: ■■ WA7101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | AUGUST 1971
 - - - | SEPTEMBER 1971
 - · - · | OCTOBER 1971

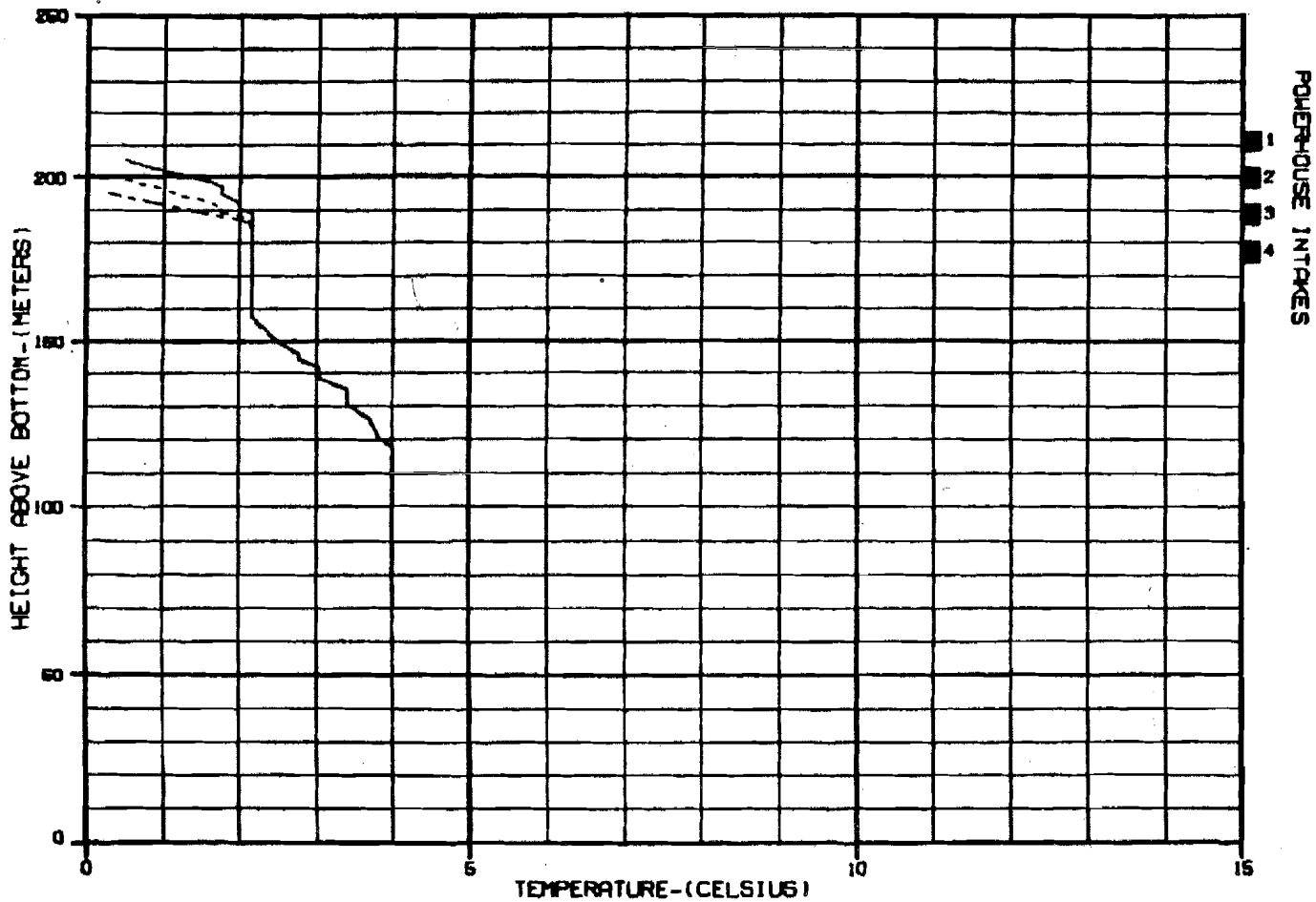


POWERHOUSE INTAKES

CASE: WA7101A - WATANA OPERATION ALONE IN 2001

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1971
 | DECEMBER 1971
 - - - - | JANUARY 1972

ALASKA POWER AUTHORITY	
EXISTING PROJECT	OPERATIONAL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
DESIGNED BY	DATE
REVISED BY	DATE
APPROVED BY	DATE



CASE: WA7101A - WATANA OPERATION ALONE IN 2001

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— | FEBRUARY 1972
 - - - - | MARCH 1972
 - · - · - | APRIL 1972

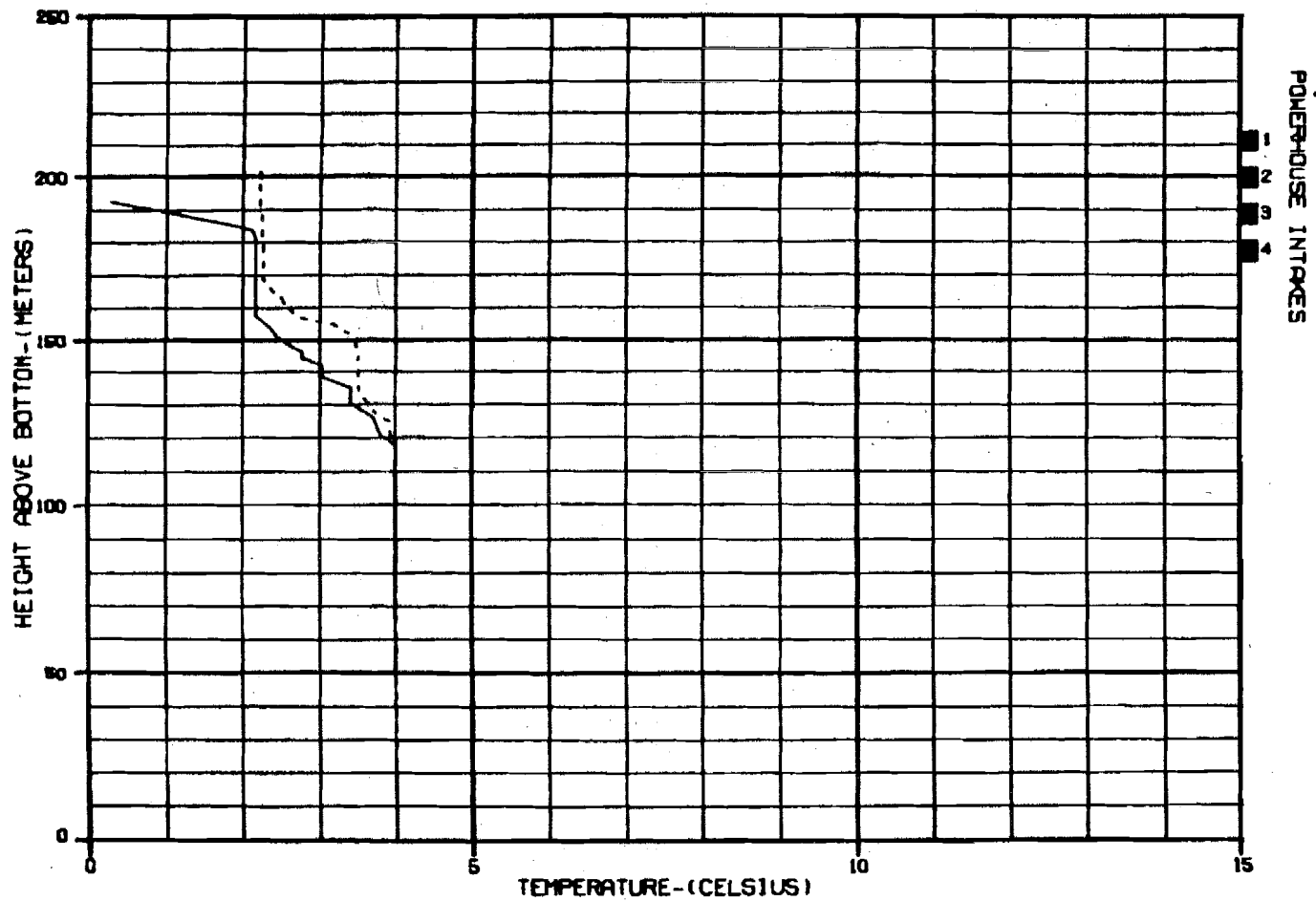
ALASKA POWER AUTHORITY

GLISTINA PROJECT OPEN MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRACO JOINT VENTURE

DATE: 11/19/72 9 AM BY 4-010-04



CASE: ■■ WA7101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

————— | MAY 1972
 | JUNE 1972
 - - - - - | JULY 1972

ALASKA POWER AUTHORITY

WATANA PROJECT

OPERATION MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

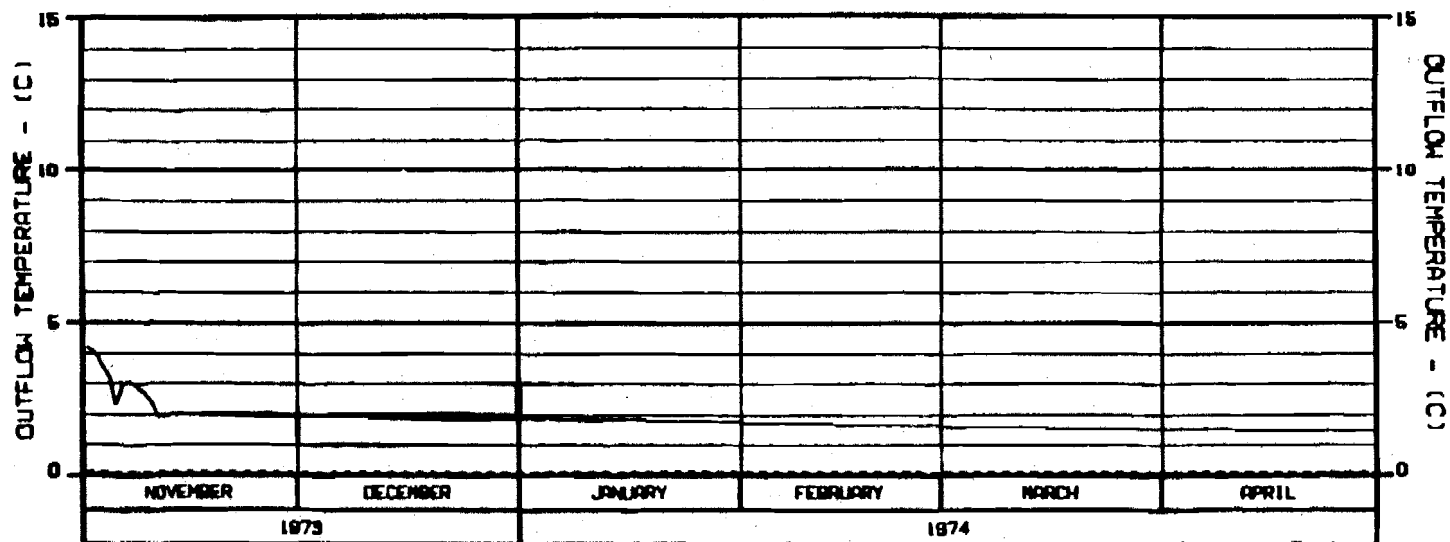
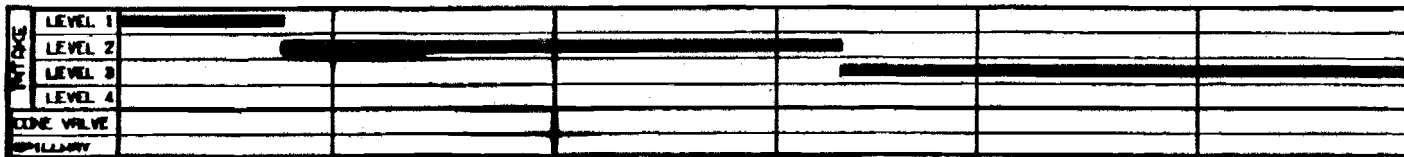
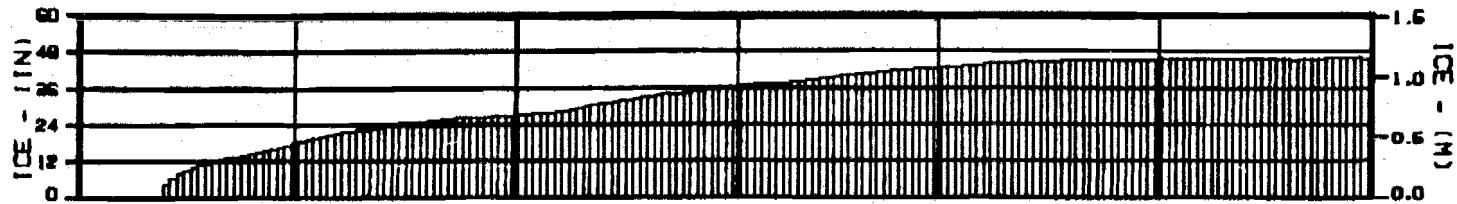
HARZA-EBASCO JOINT VENTURE

CHART NO. WA-0000

0 JAN 81

4E-010-04

EXHIBIT W



LEGEND: CASE: ■■ HA7401A - WATANA OPERATION ALONE IN 2001 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

ALASKA POWER AUTHORITY

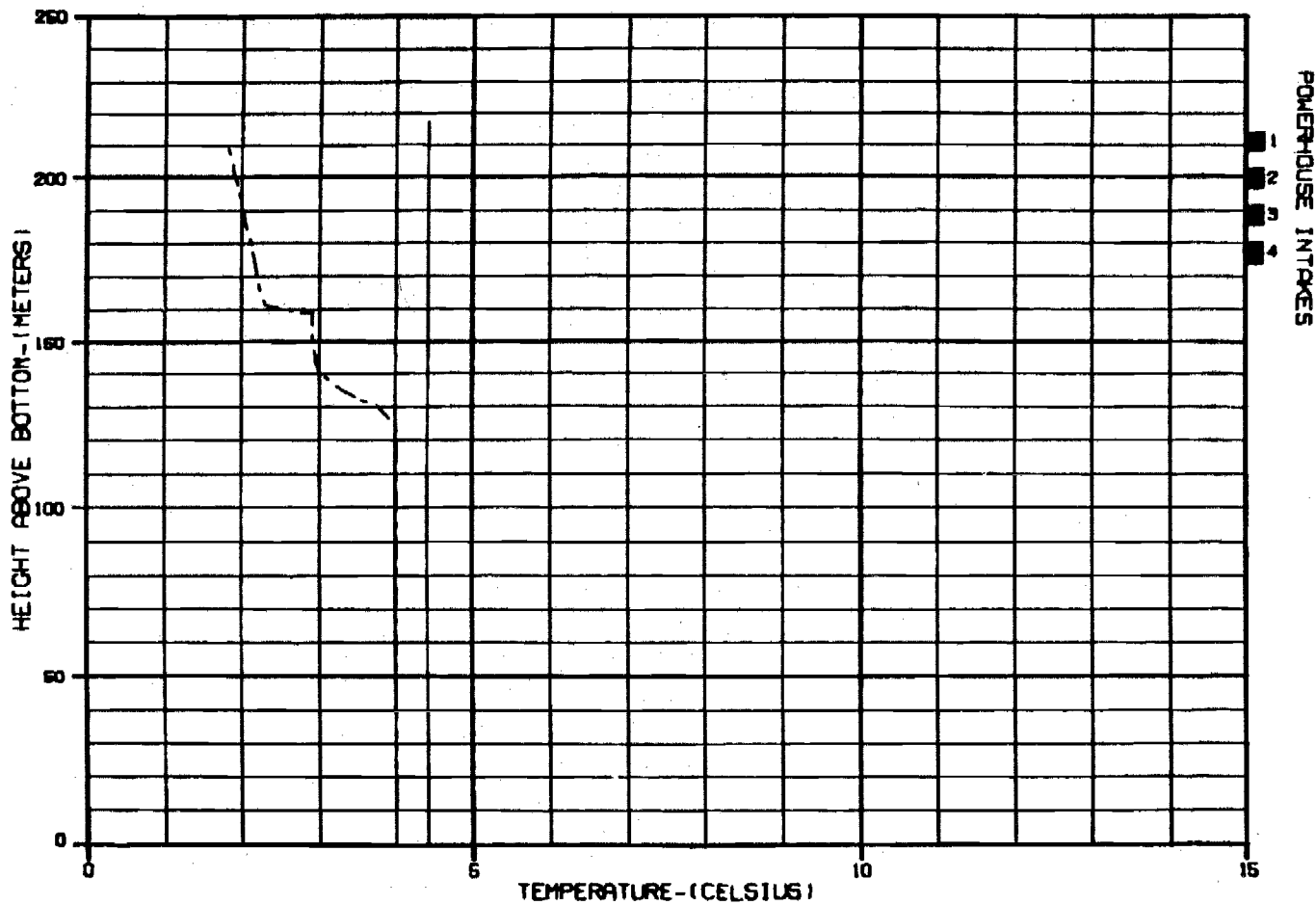
EXISTING PROJECT OPENED MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBRSCO JOINT VENTURE

DESIGNED: ILLINOIS 8 JAN 84

48-010-04



CASE: ■■ WA7401A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 NOVEMBER 1973
 - - - - - 1 DECEMBER 1973
 - · - · - 1 JANUARY 1974

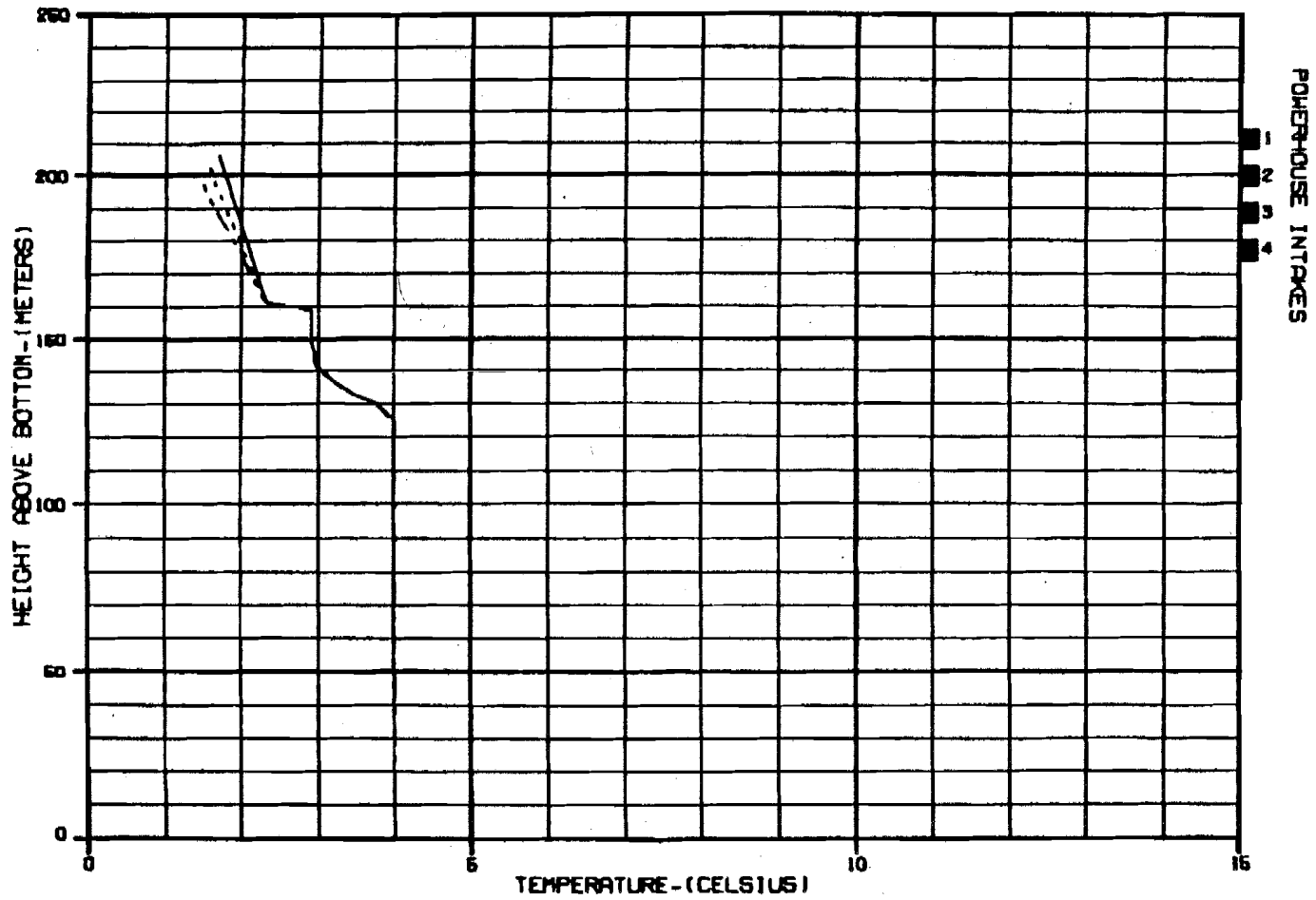
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DYNOMI MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHANGES ALLOWED 9 JAN 84 4E-010-04



CASE: W7401A - WATANA OPERATION ALONE IN 2001

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 FEBRUARY 1974
 - - - 1 MARCH 1974
 - · - 1 APRIL 1974

ALASKA POWER AUTHORITY

WATANA PROJECT

DYNAMIC MODEL

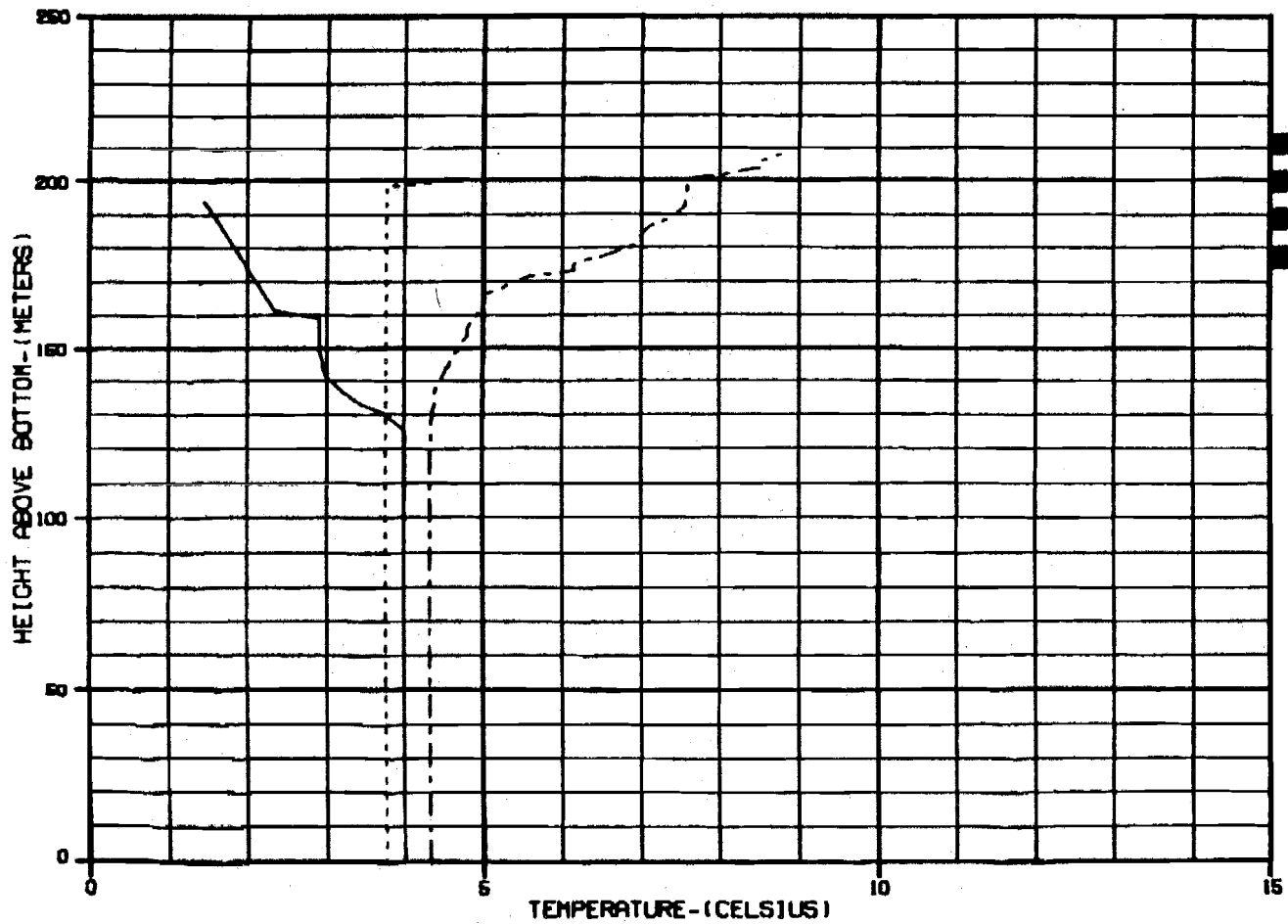
WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGN: ALLISON

8 JAN 84

4E-010-04

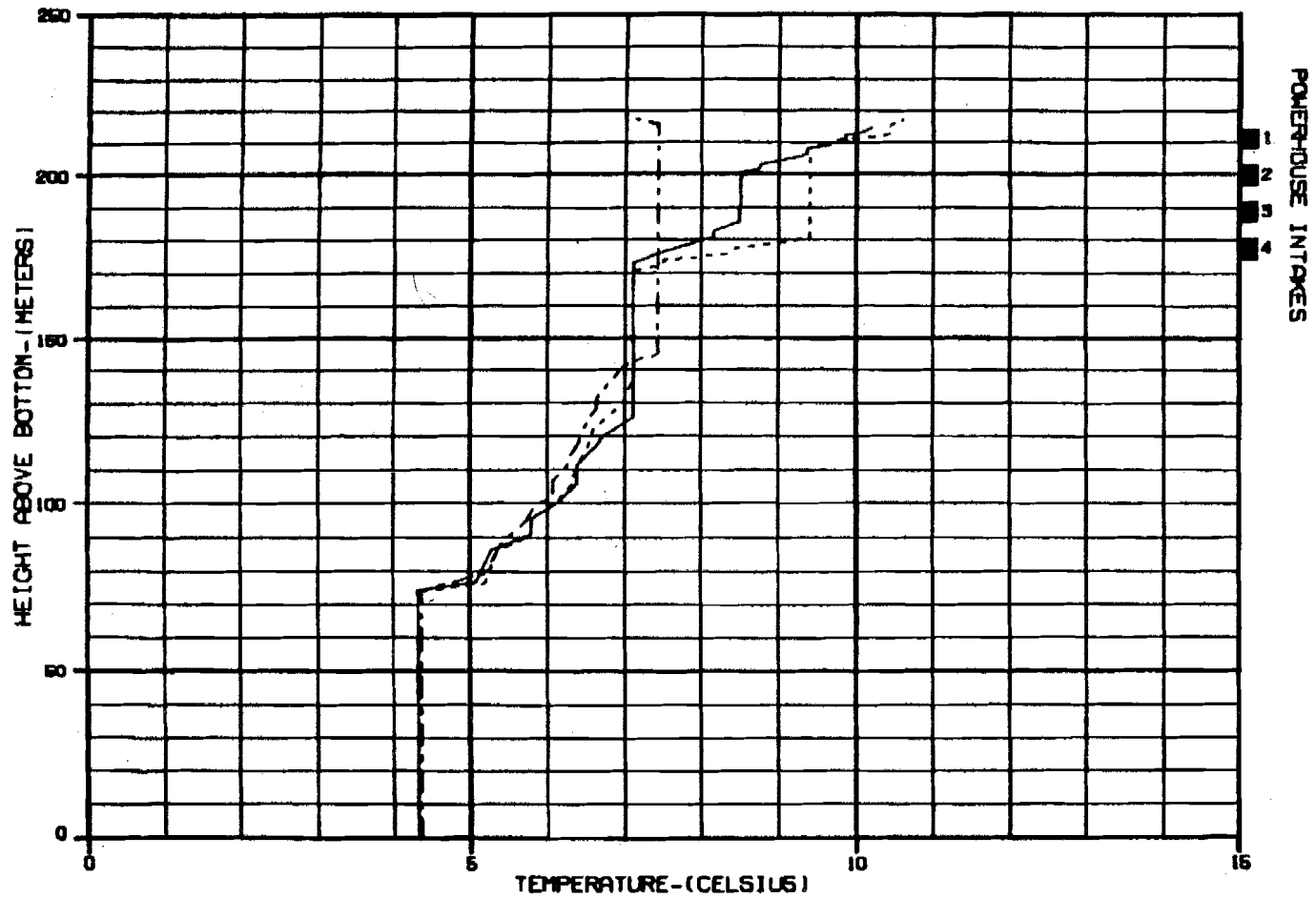


POWERHOUSE INTAKES

CASE: WA7401A - WATANA OPERATION ALONE IN 2001

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | MAY 1974
 - - - - - | JUNE 1974
 - · - · - | JULY 1974

ALASKA POWER AUTHORITY		
OUTFIT PROJECT	DYNEM MODEL	
WATANA RESERVOIR		
TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DESIGNER: ELLIOTT	DRAWN BY:	42-010-04



CASE: WA7401A - WATANA OPERATION ALONE IN 2001

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 AUGUST 1974
 1 SEPTEMBER 1974
 - - - - - 1 OCTOBER 1974

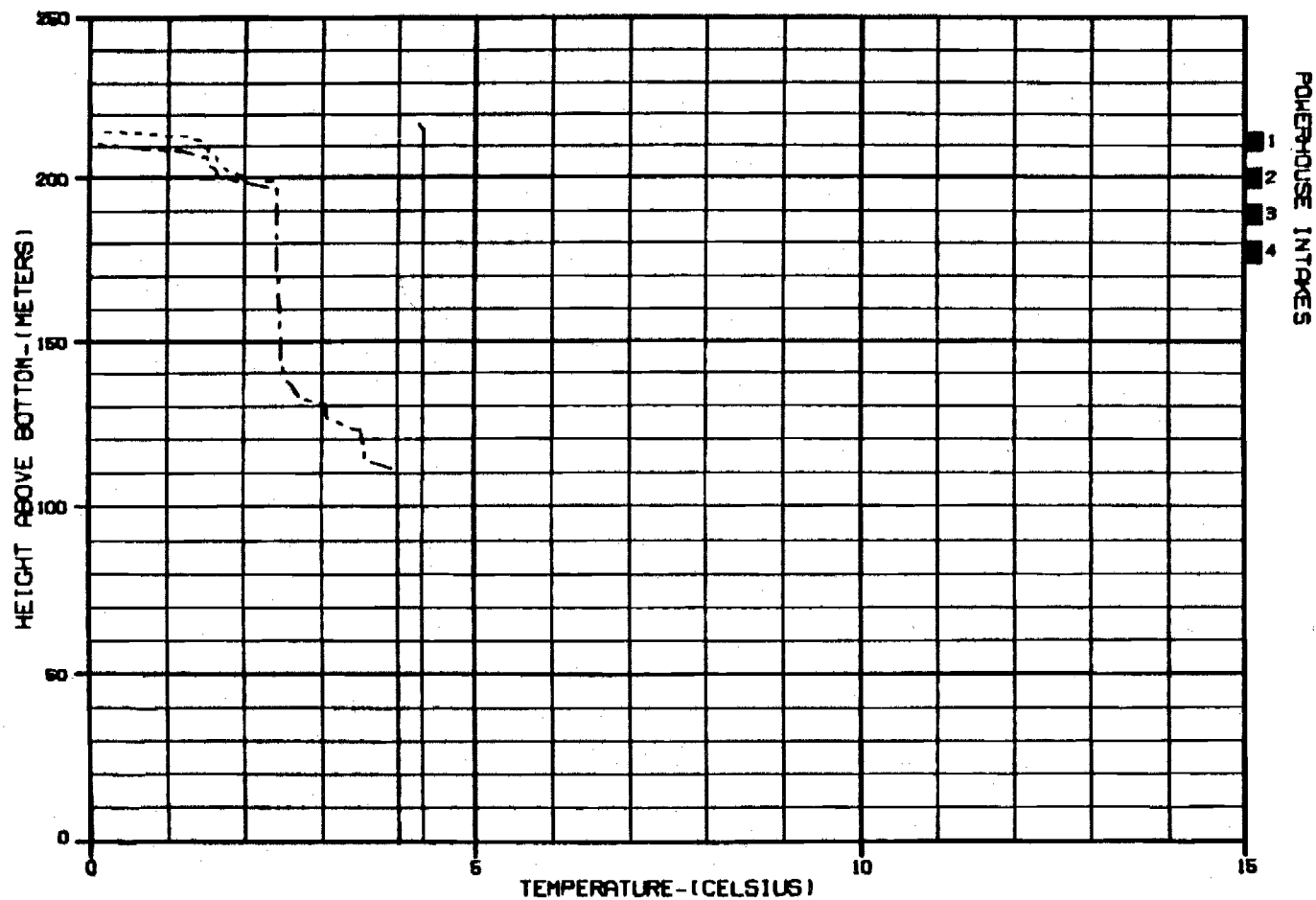
ALASKA POWER AUTHORITY

WATANA PROJECT GREEN HOOK

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

ORDER - 44-0000 2 JAN 84 42-010-04



CASE: ■■ WA7401A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1974
- - - 1 DECEMBER 1974
- · - · 1 JANUARY 1975

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

DYNEM MODEL

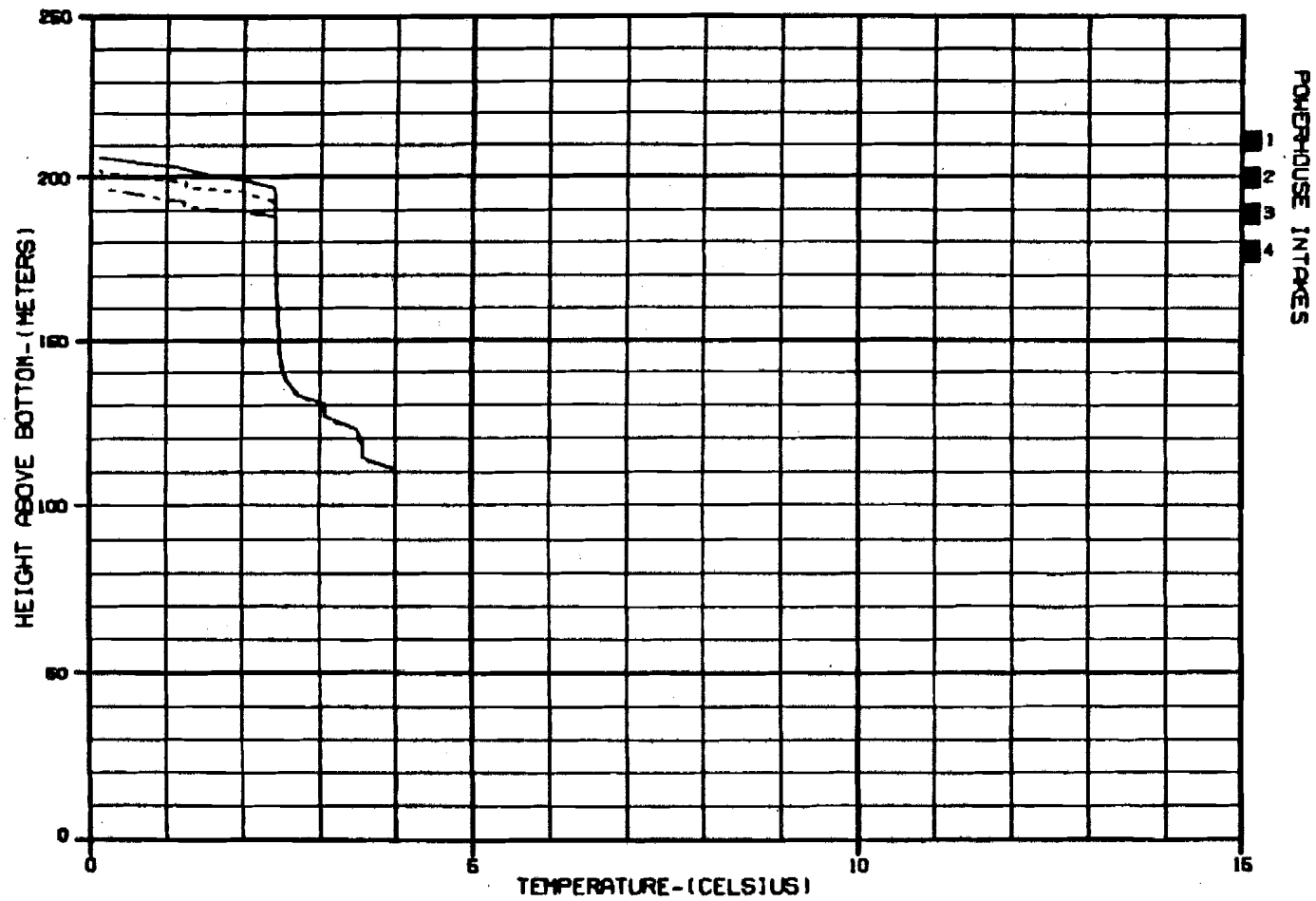
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGN. 8/2/75

9 JAN 76

42-D10-04



CASE: WA7401A - WATANA OPERATION ALONE IN 2001

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— | FEBRUARY 1975
 | MARCH 1975
 - - - - | APRIL 1975

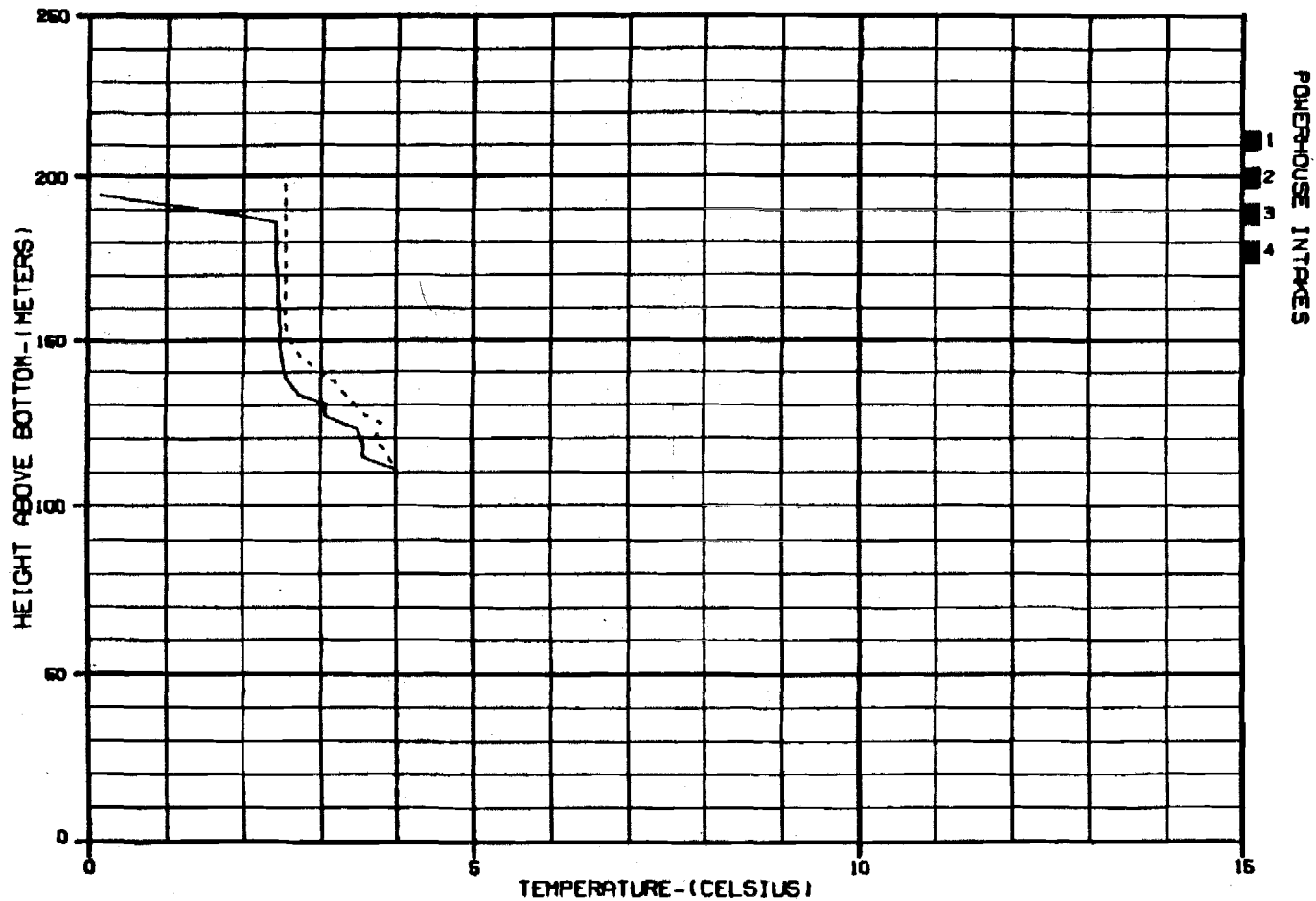
ALASKA POWER AUTHORITY

SUBMITTAL PROJECT | OPENING MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

OWNER: ALASKA | DRAWN BY: | DATE: 42-010-04



CASE: ■■ WA7401A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | MAY 1975
 - - - | JUNE 1975
 - · - · | JULY 1975

ALASKA POWER AUTHORITY

WATANA PROJECT

OVERSEAS MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

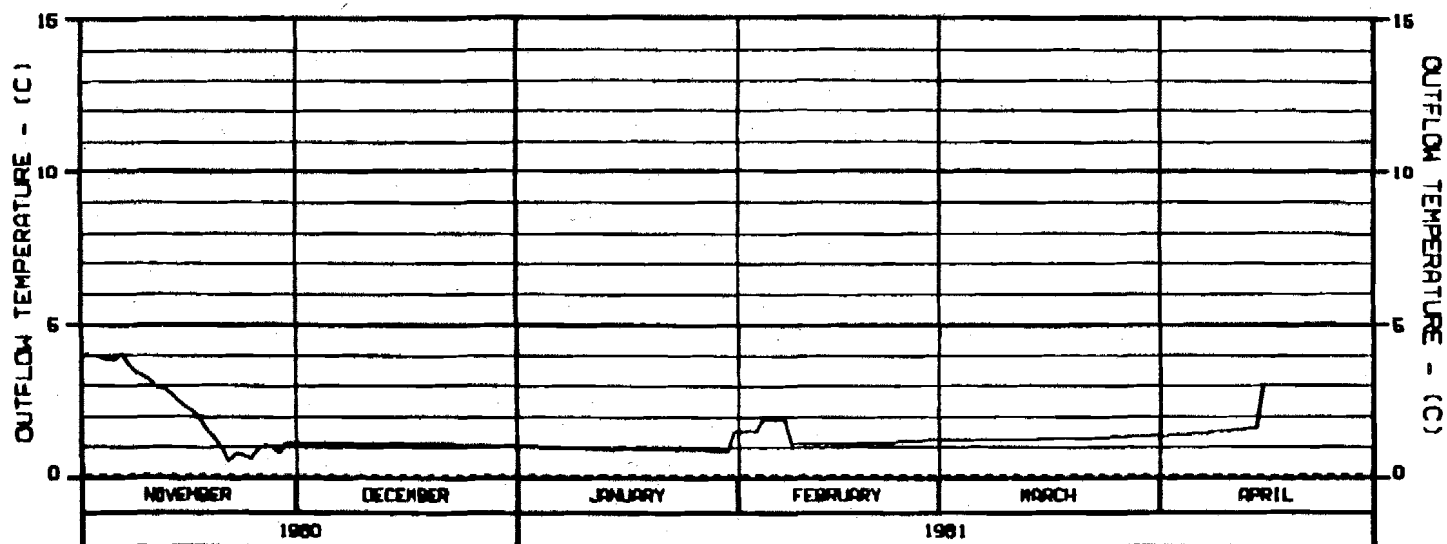
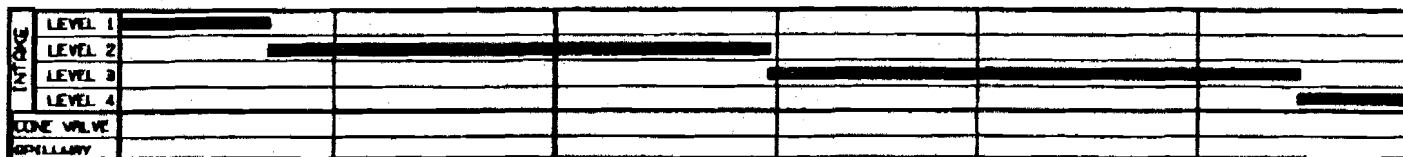
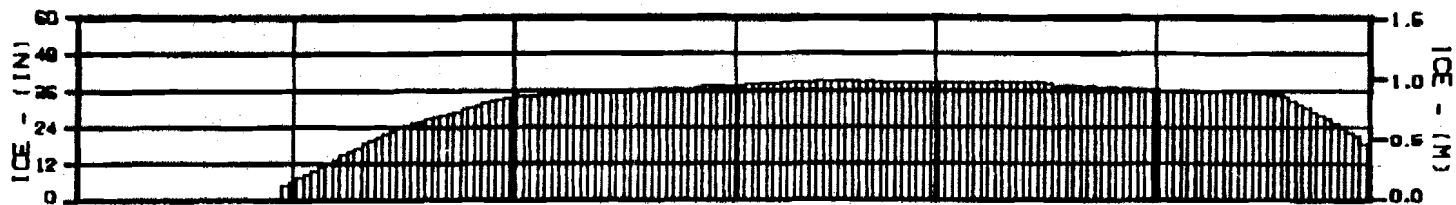
HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. J. PETER

8 JAN 81

42-010-04

EXHIBIT X



LEGEND: CASE # WAB1182101A - WATANA OPERATION ALONE IN 2001

— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

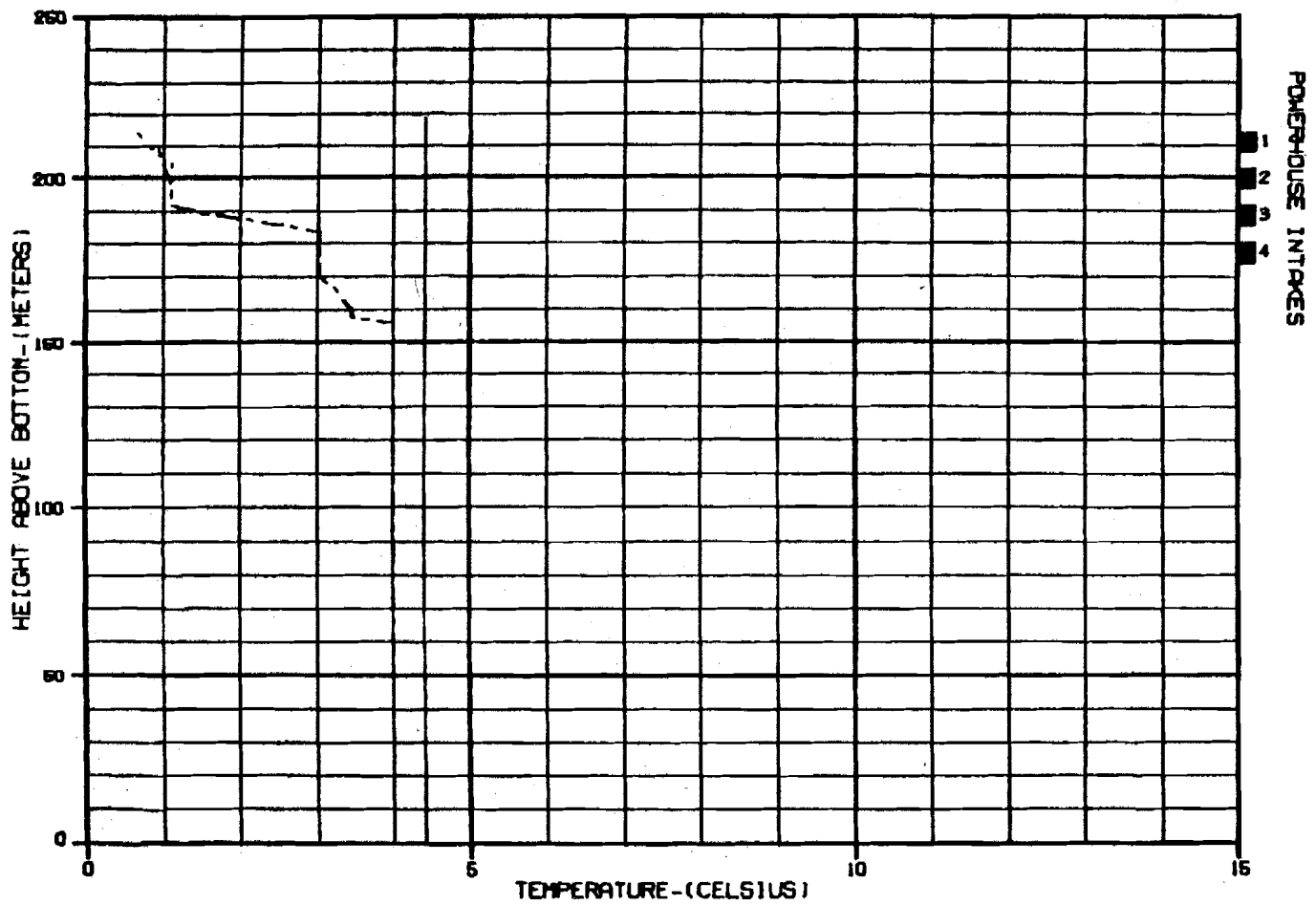
ALASKA POWER AUTHORITY

SUBTNA PROJECT DYNEM MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

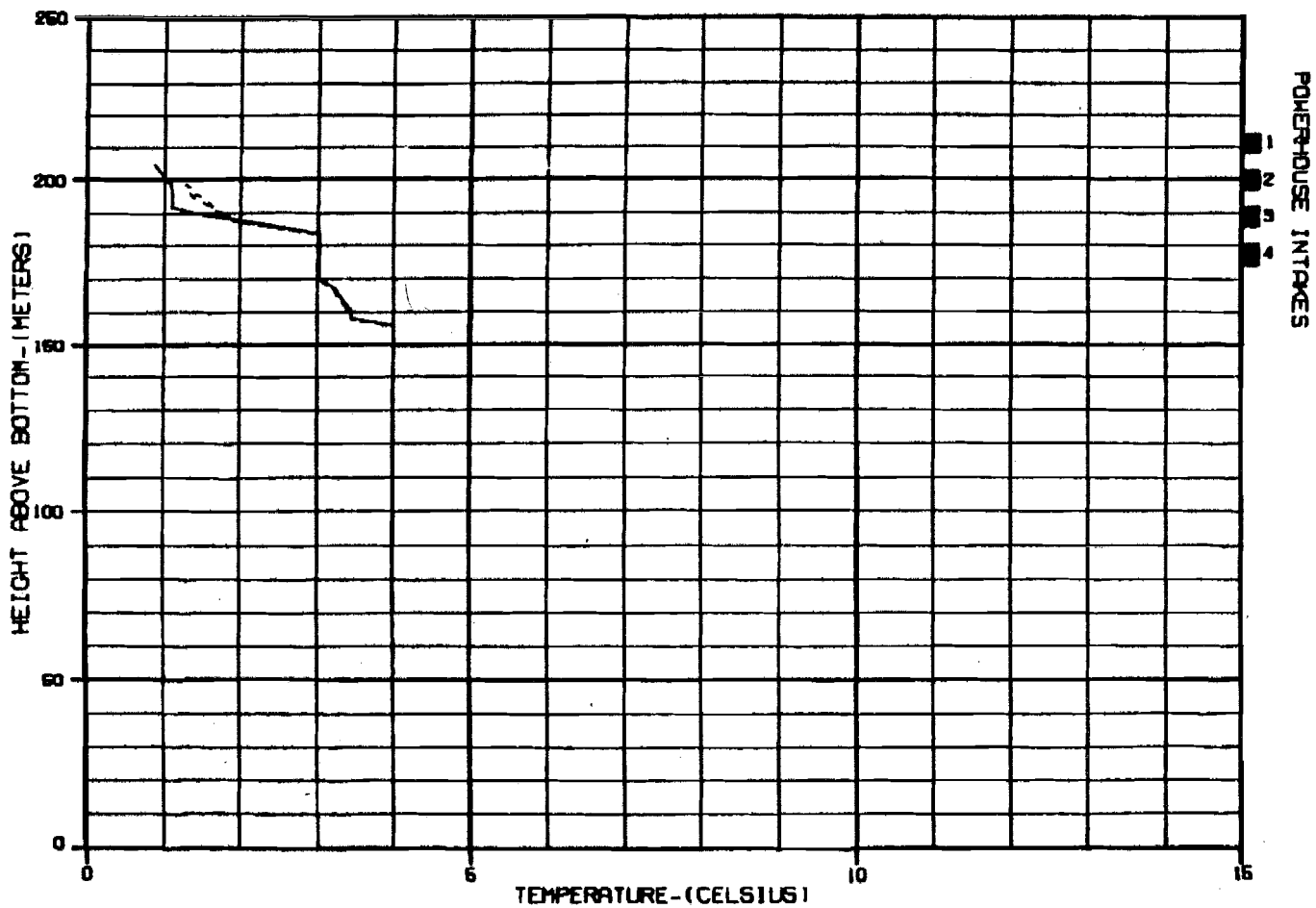
DRAWN: S.L. HARRIS 8 JAN 01 48-000-04



CASE: ■■ WAB11B2101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ——— 1 NOVEMBER 1980
 1 DECEMBER 1980
 - - - - 1 JANUARY 1981

ALASKA POWER AUTHORITY		
WATANA PROJECT	OPENING MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBAGCO JOINT VENTURE		
ENGINEER: J.L. DUNN	D. AM 80	42-010-04



CASE: ■■ WAB1182101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— 1 FEBRUARY 1981
 1 MARCH 1981
 - - - - 1 APRIL 1981

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

DIVISION MODEL

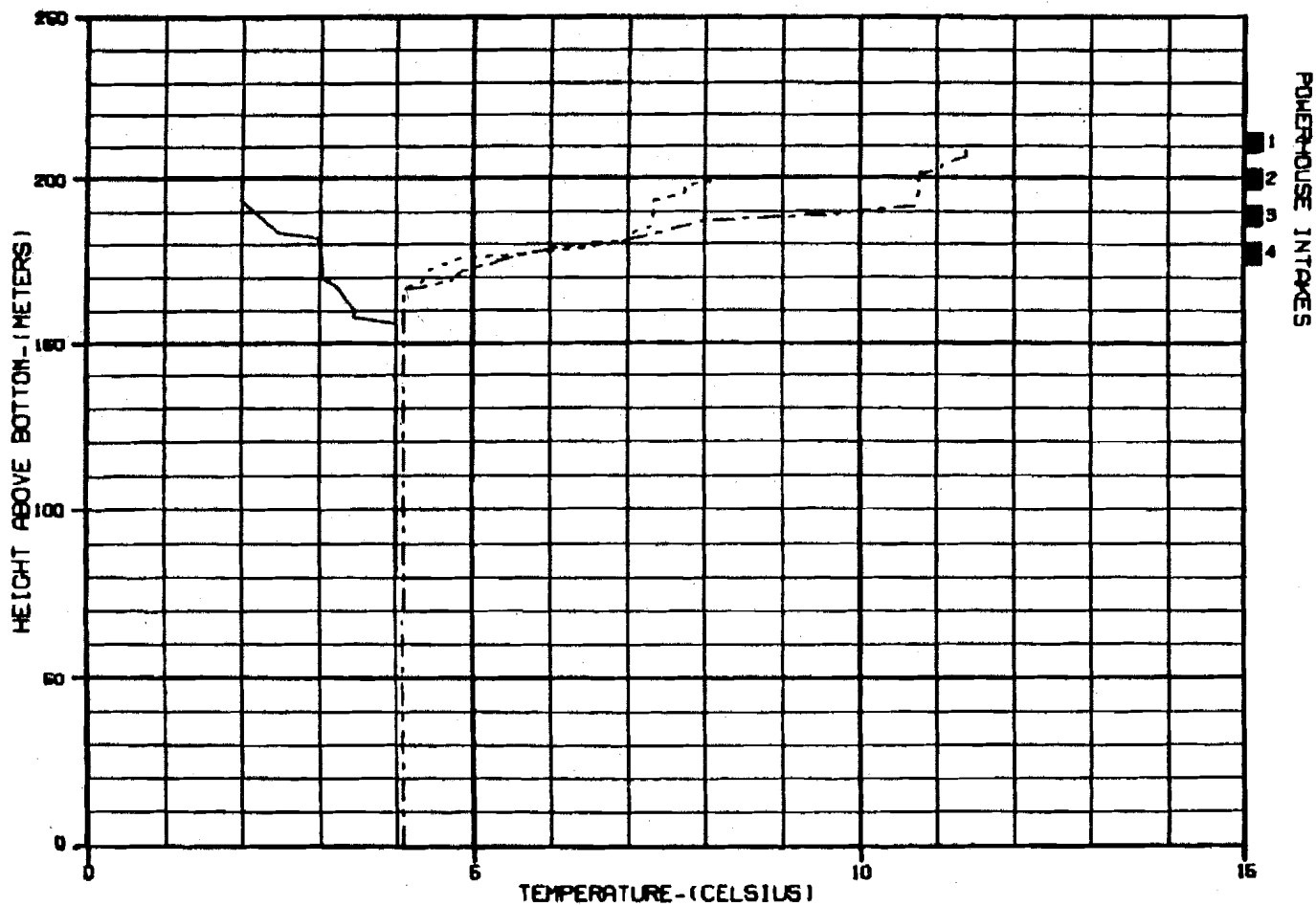
WATANA RESERVOIR
 TEMPERATURE PROFILES

HAZA-EGRECO JOINT VENTURE

DATE: 01-04-81

8 JAN 81

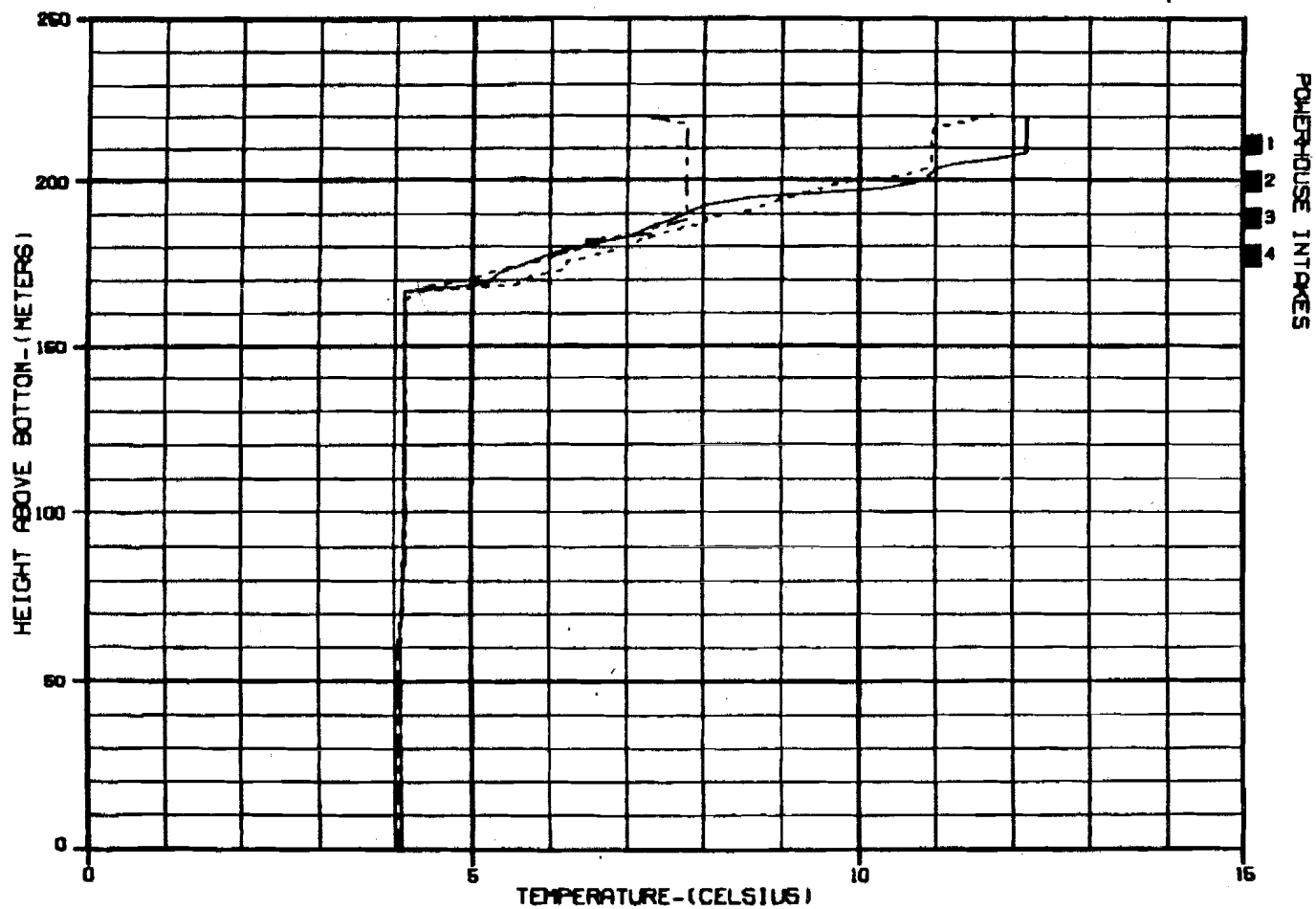
4E-010-04



CASE: WAB1182101A - WATANA OPERATION ALONE IN 2001

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 MAY 1981
 1 JUNE 1981
 - - - - 1 JULY 1981

ALASKA POWER AUTHORITY		
PLANT PROJECT	DYWIDOR MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DRIVER: B.L.M. 95	DATE: 8/1/81	42-DIG-04



CASE: ■■ WAB11B2101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | AUGUST 1981
 - - - - - | SEPTEMBER 1981
 - - - - - | OCTOBER 1981

ALASKA POWER AUTHORITY

WATANA PROJECT

OPERATION

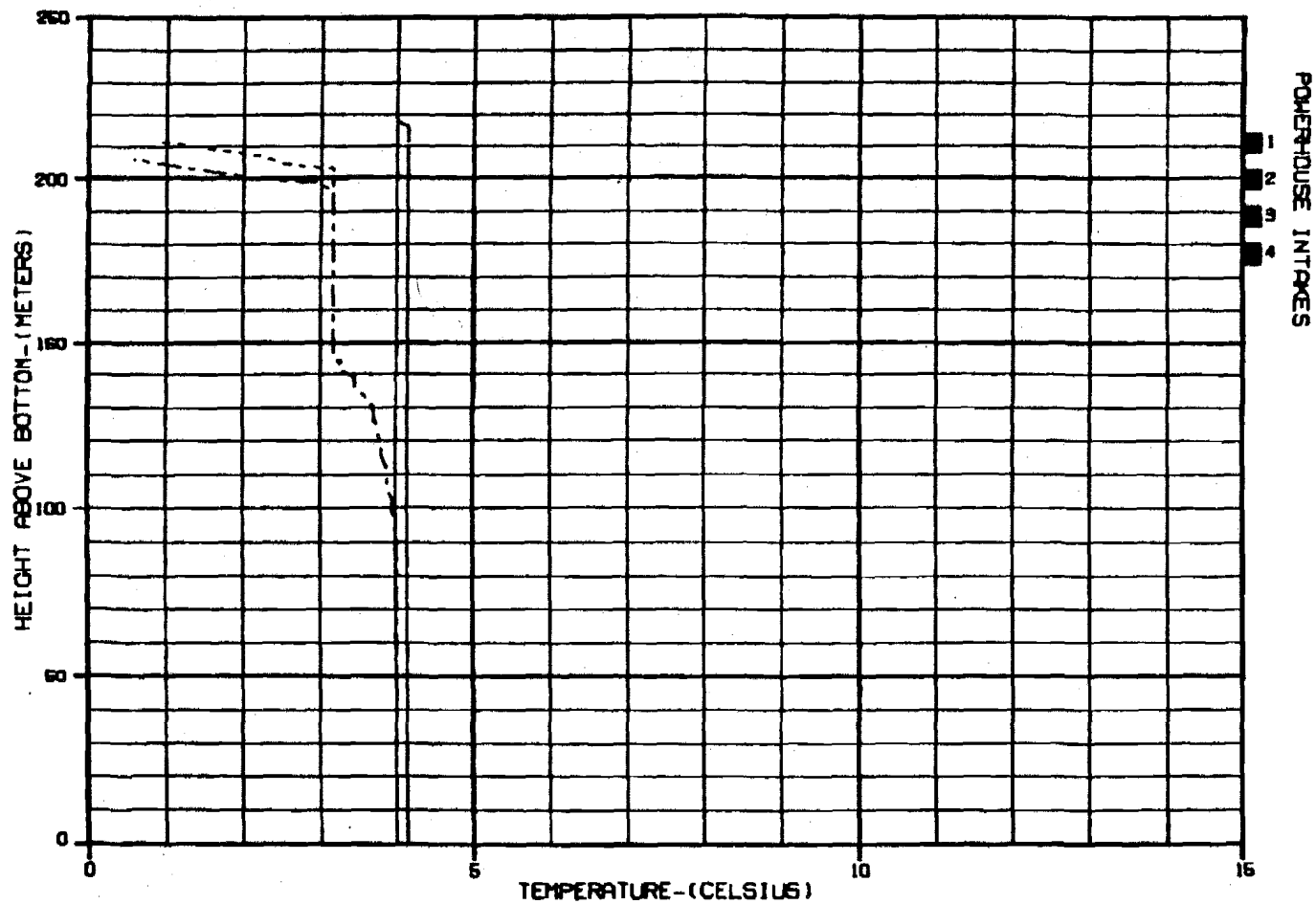
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRSCO JOINT VENTURE

DESIGN: ELDON

3 JAN 81

4E-010-04



CASE: ■■ WAB1182101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1981
- 1 DECEMBER 1981
- · - · - 1 JANUARY 1982

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

DYKEMA MODEL

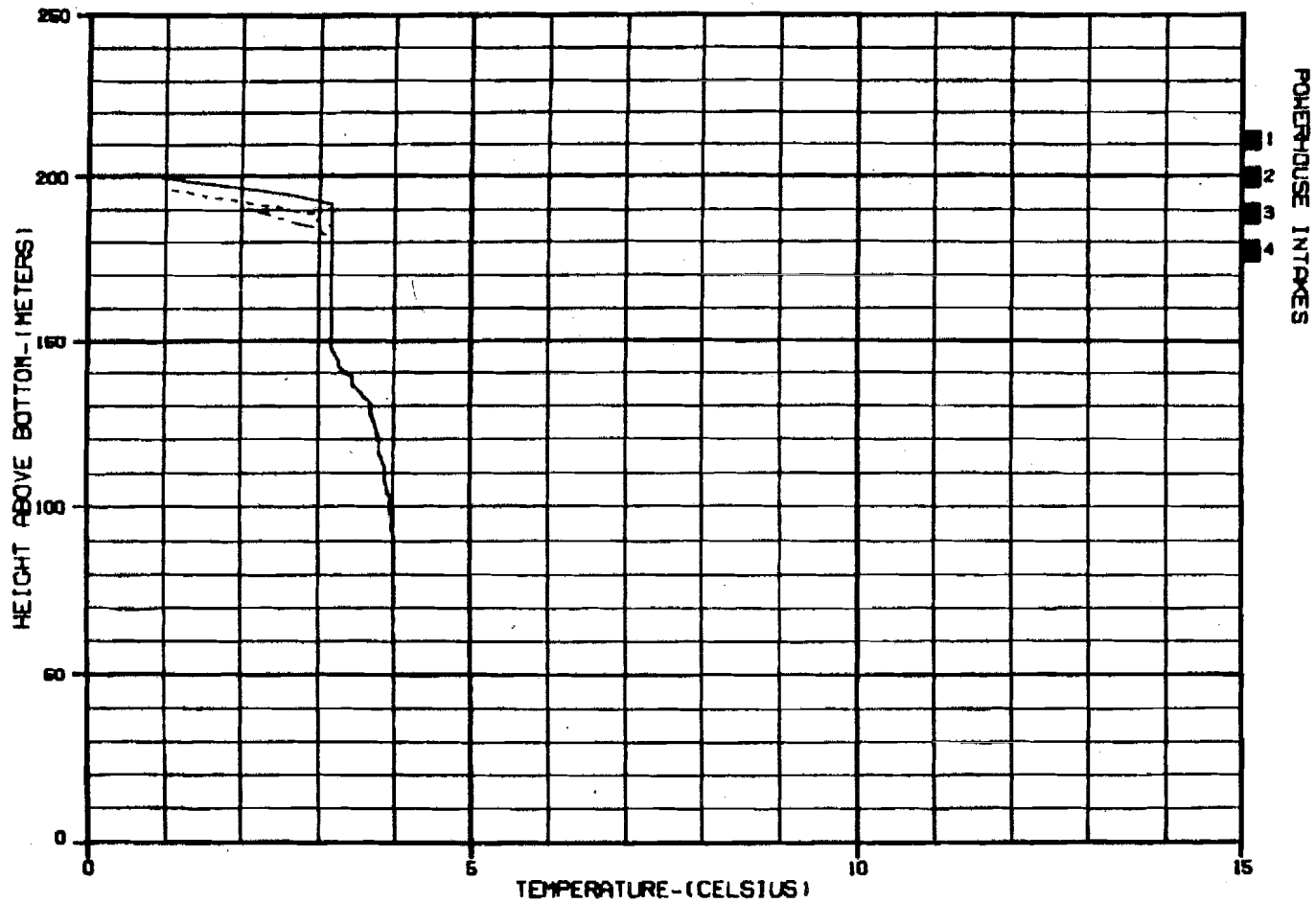
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHUCK - B.L. 0000

9 JUN 81

42-010-04



CASE: ■■ WAB1182101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | FEBRUARY 1982
 | MARCH 1982
 - - - - | APRIL 1982

ALASKA POWER AUTHORITY

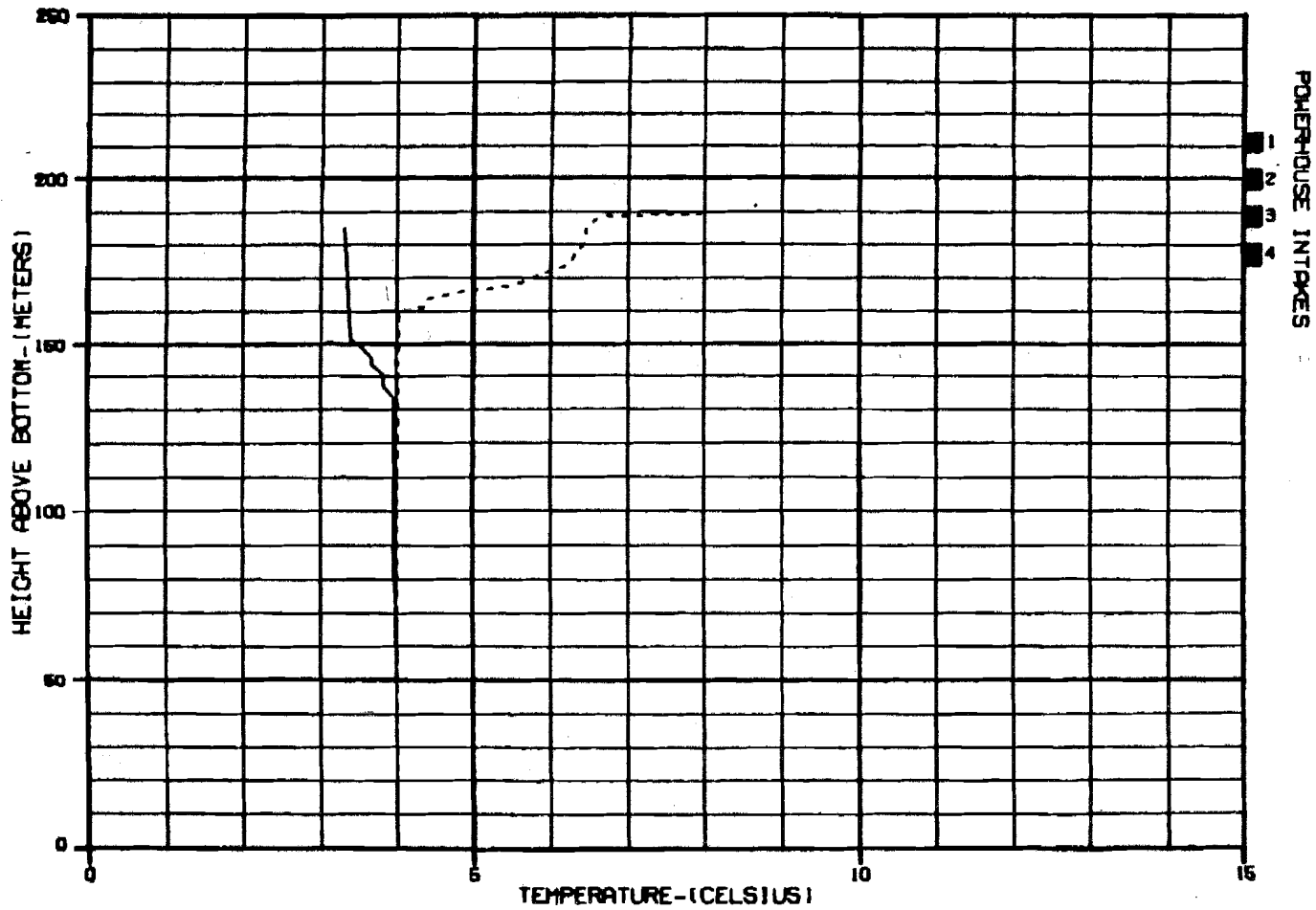
SUBMITTA PROJECT OPENIN MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBRACCO JOINT VENTURE

CHGREL. 811-005 9 JAN 81 42-010-04

EXHIBIT Y



CASE: ■■ WAB1182101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 MAY 1983
 - - - 1 JUNE 1983

ALASKA POWER AUTHORITY

SUBITNA PROJECT

DYEDEN MODEL

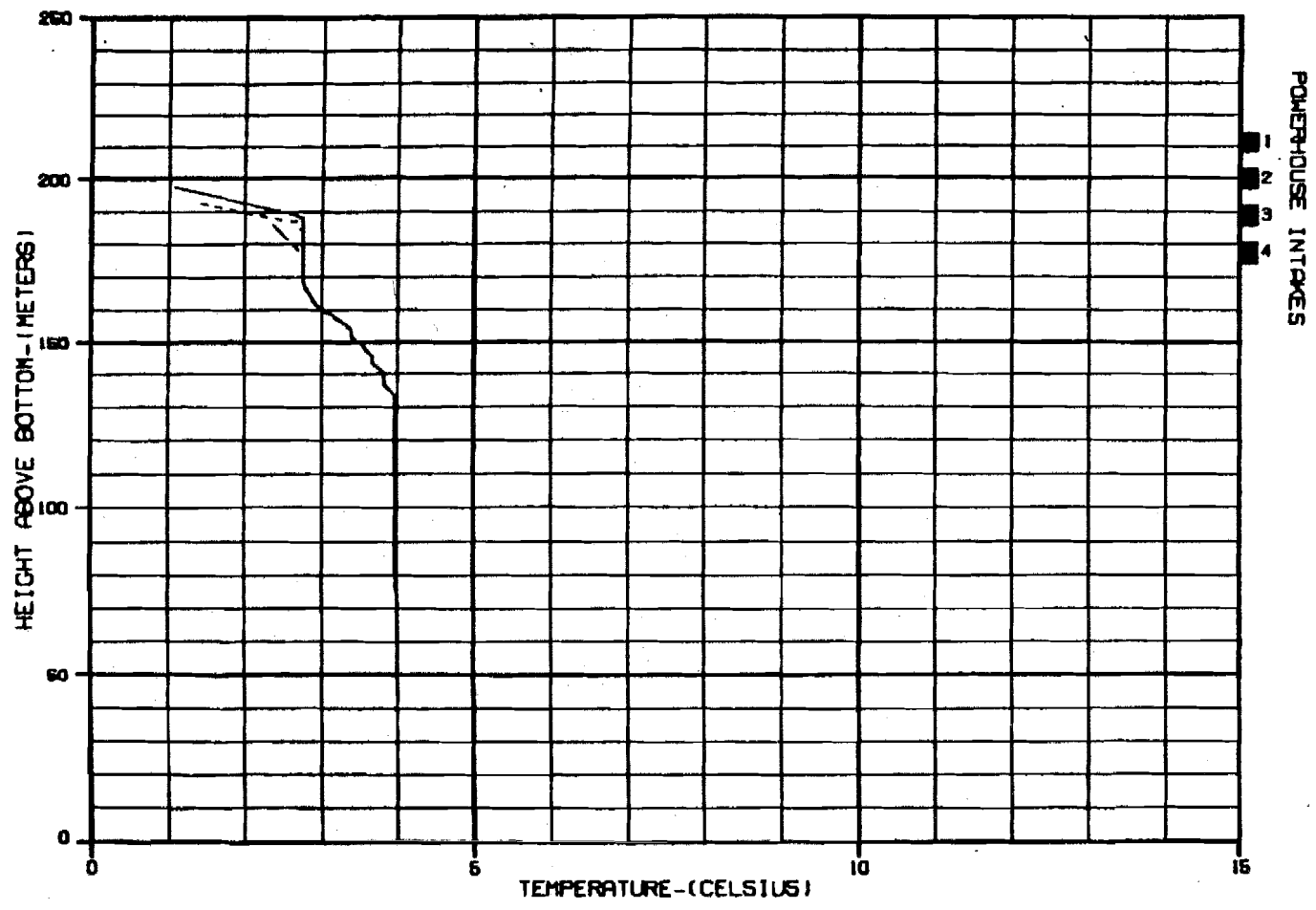
WATANA RESERVOIR
 TEMPERATURE PROFILES

WARZA-EBRSCO JOINT VENTURE

ORIGIN: R.A. 9/83

8 JAN 84

42-010-04

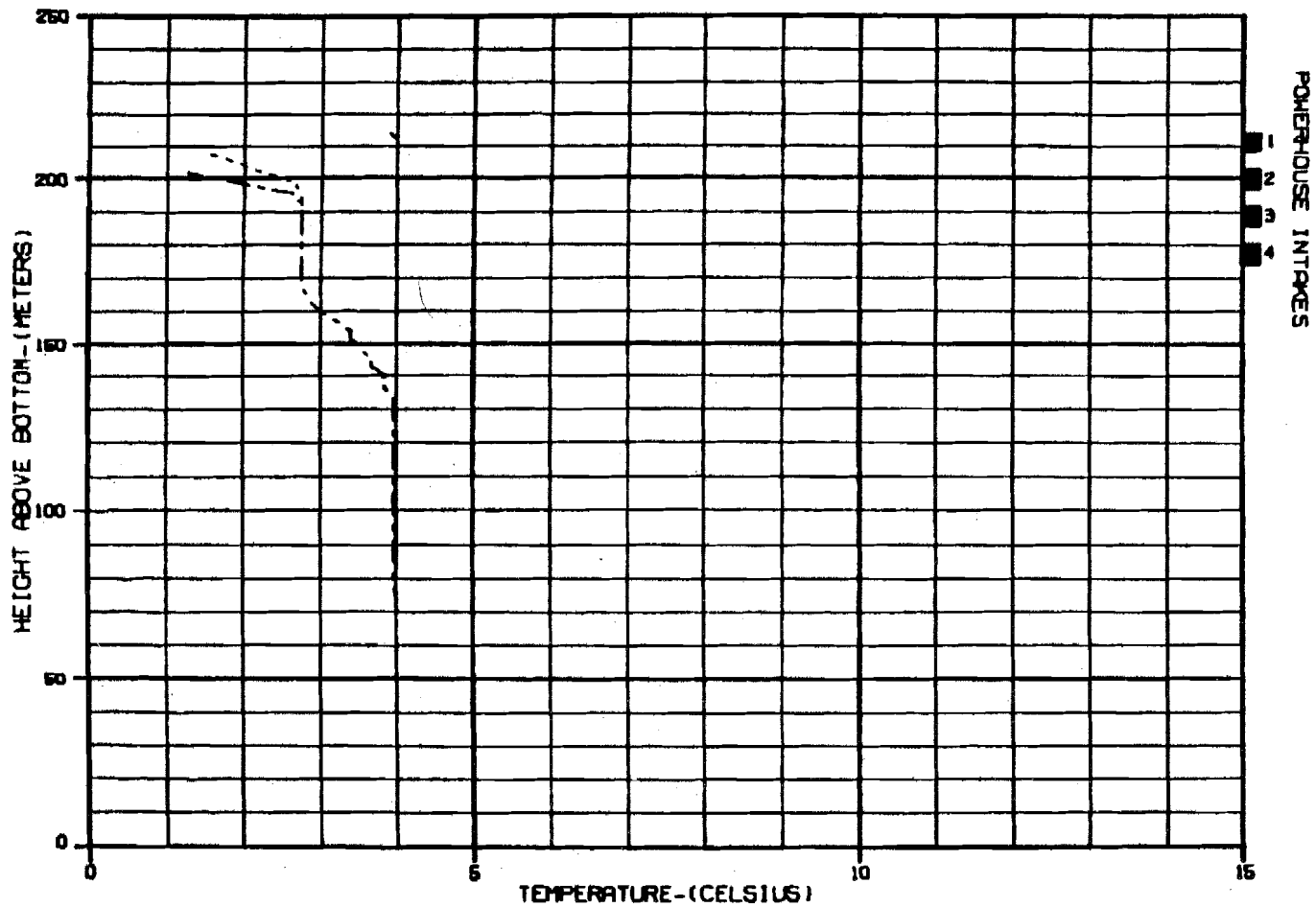


POWERHOUSE INTAKES

CASE: ■■ WAB1182101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1983
 - - - - | MARCH 1983
 - · - · | APRIL 1983

ALASKA POWER AUTHORITY	
SUBMITTA PROJECT	DYNOSH MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
CHARGE: 84-0000	42-010-04



CASE: ■■ WAB1(82)01A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

————— 1 NOVEMBER 1982
 1 DECEMBER 1982
 - - - - - 1 JANUARY 1983

ALASKA POWER AUTHORITY

WATANA PROJECT

OPERATION MODEL

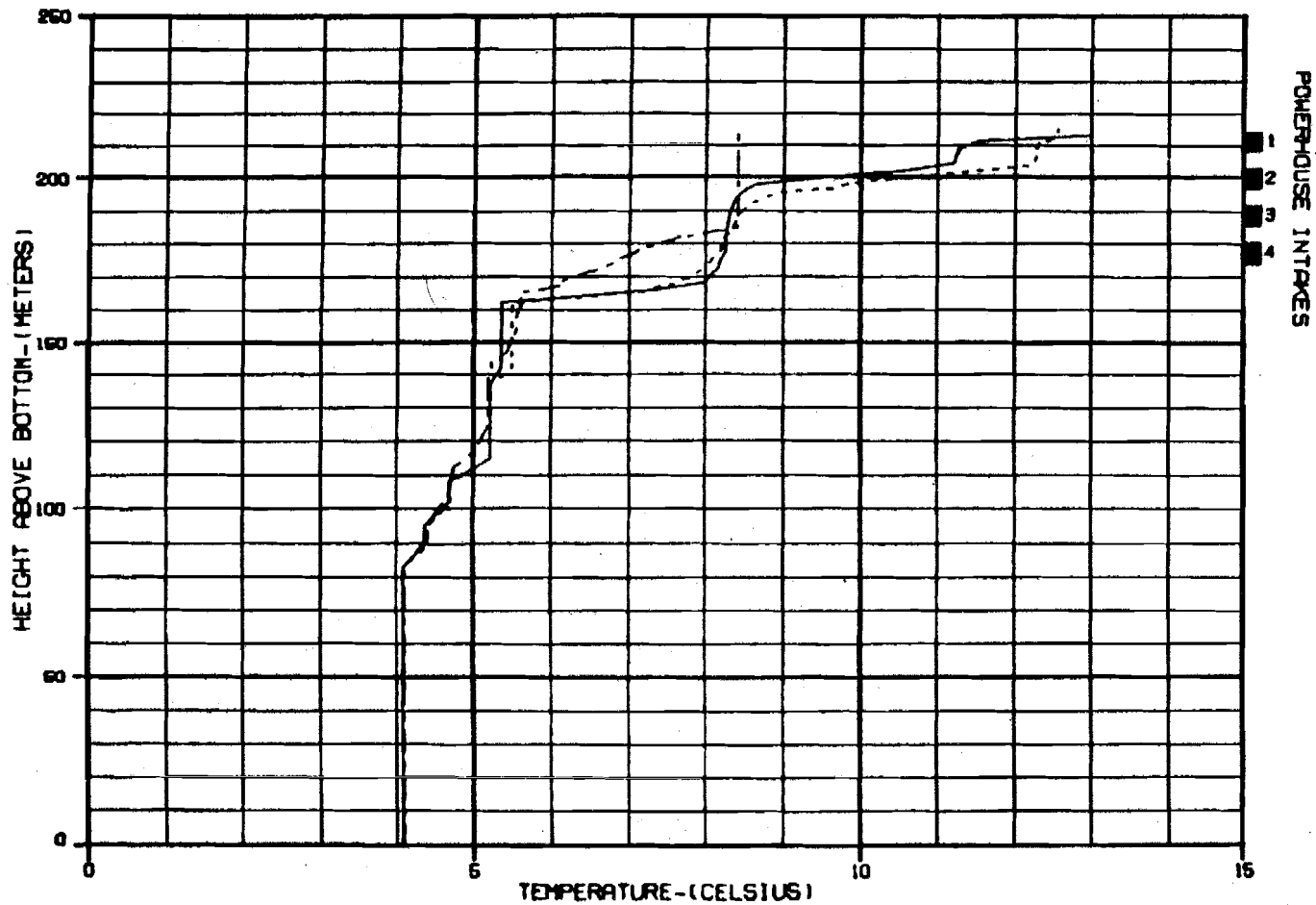
WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DRWG. 11-010

0 JAN 83

47-010-01



CASE: ■■ WAB1(B2)01A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 AUGUST 1982
 1 SEPTEMBER 1982
 - - - - - 1 OCTOBER 1982

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OPERATION MODEL

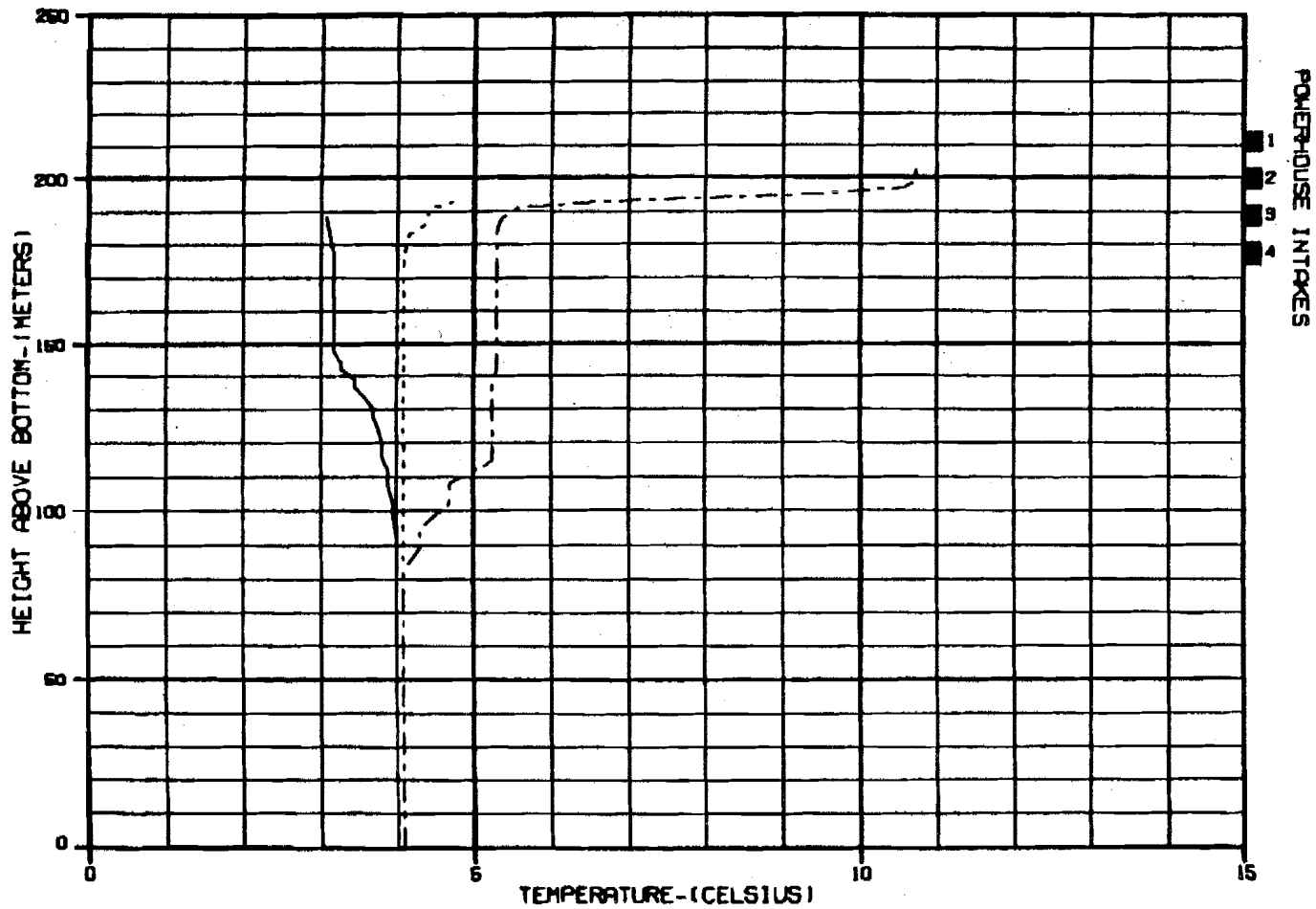
WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

CHANGES: 01.0000

0 JAN 81

42-010-04



CASE: ■■ WAB1182101A - WATANA OPERATION ALONE IN 2001 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | MAY 1992
- | JUNE 1992
- | JULY 1992

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OPERON MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

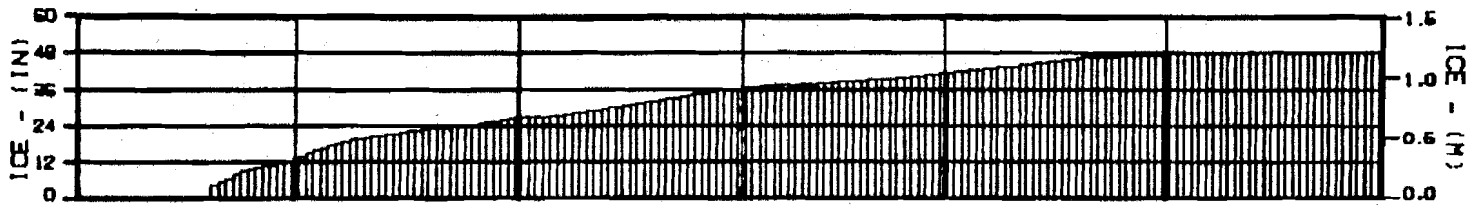
DESIGN: ELLIOTT

0 JAN 84

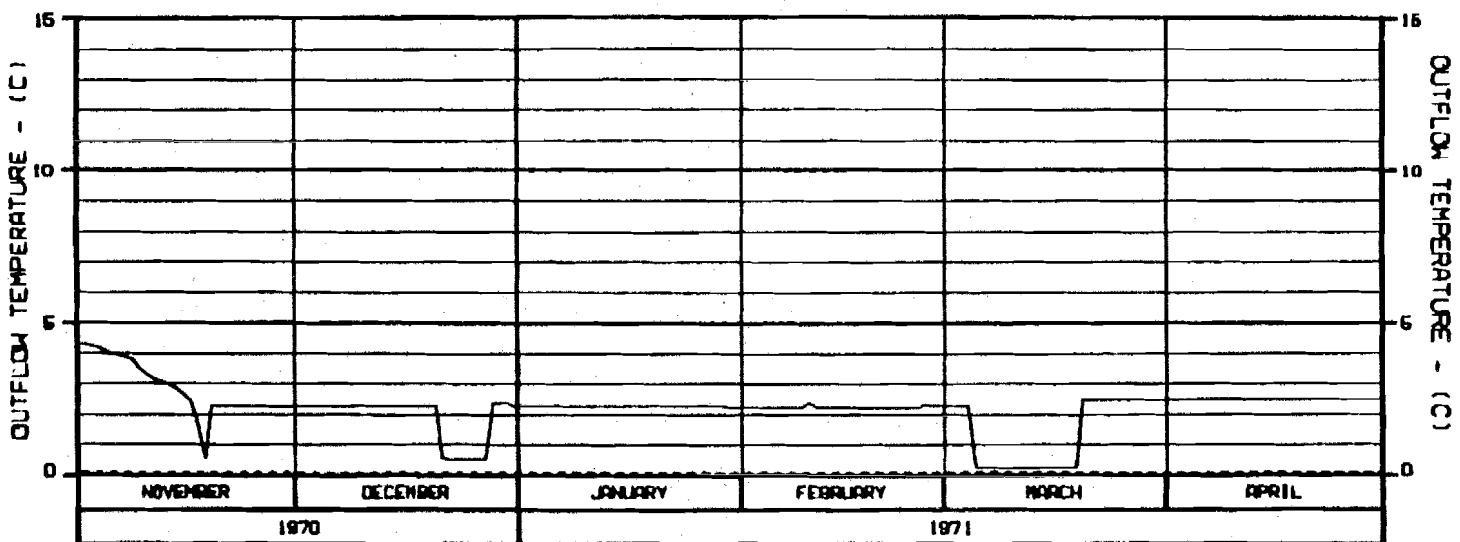
4E-010-04

WATANA AND DEVIL CANYON OPERATING
2002 Energy Demands
Watana Reservoir Temperatures

EXHIBIT Z



INTAKE	LEVEL 1					
	LEVEL 2					
	LEVEL 3					
	LEVEL 4					
	CONE VALVE					
	SPILLWAY					

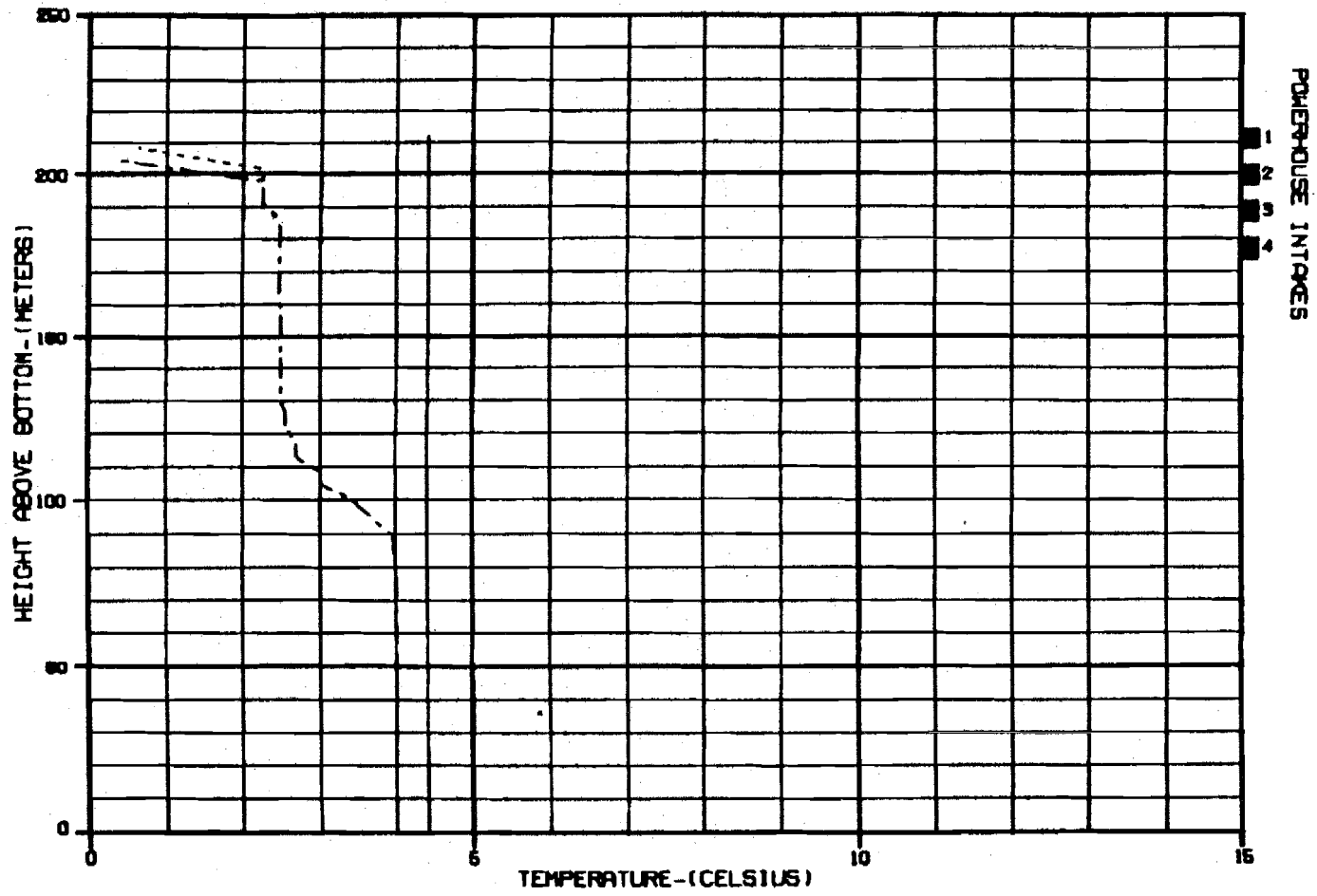


LEGEND: CASE: ■■ WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2151 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	OPERATION MODEL
WATANA RESERVOIR	
OUTFLOW TEMPERATURE	
AND ICE GROWTH	
WARZA-EBASCO JOINT VENTURE	
DATE: 01.01.81	48-500-01

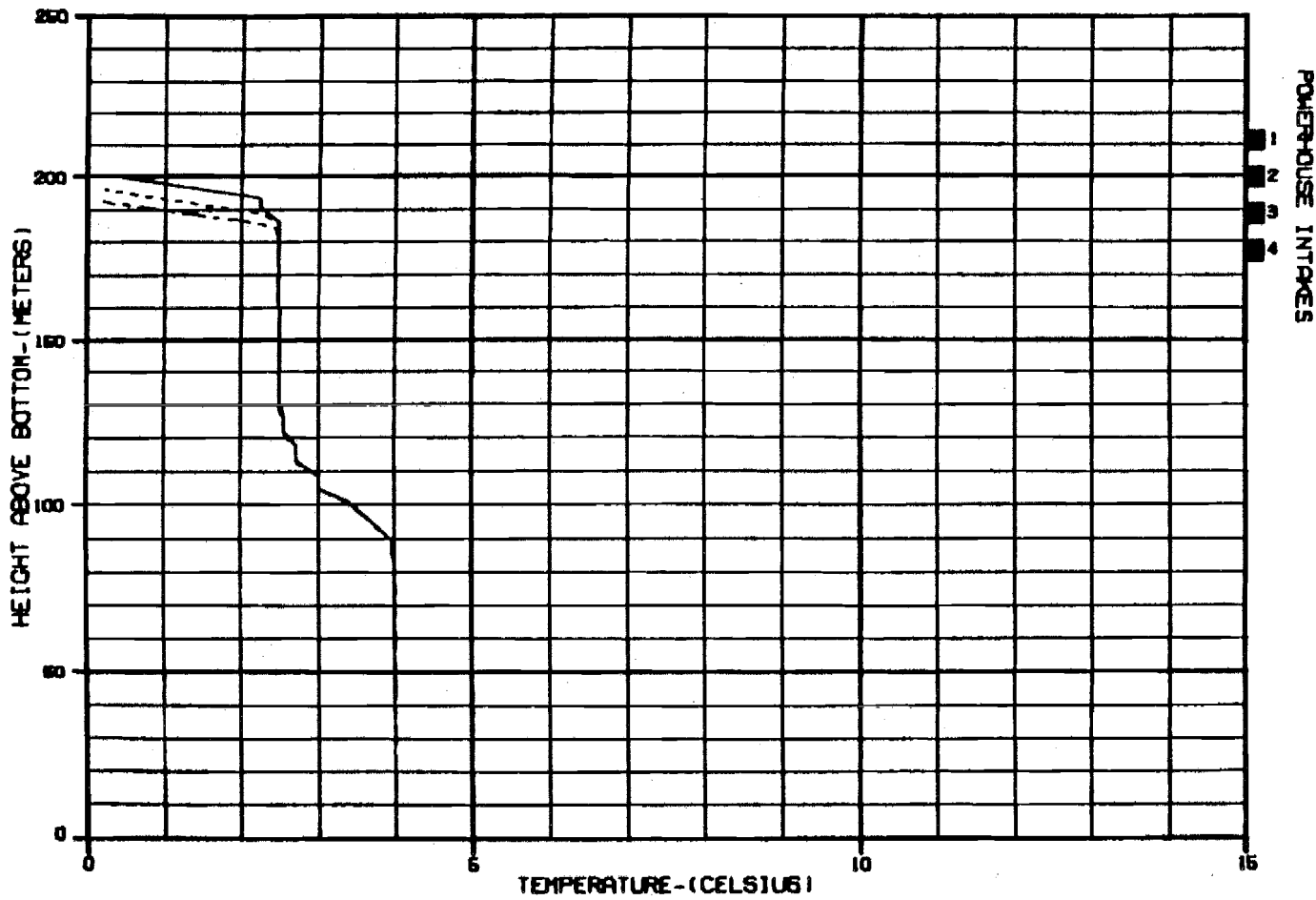


POWERHOUSE INTAKES
1
2
3
4

CASE: WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1970
 - - - - - | DECEMBER 1970
 - · - · - | JANUARY 1971

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	OPERATION MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBRACCO JOINT VENTURE		
ISSUED: 01/08/71	7 AM '71	42-010-04



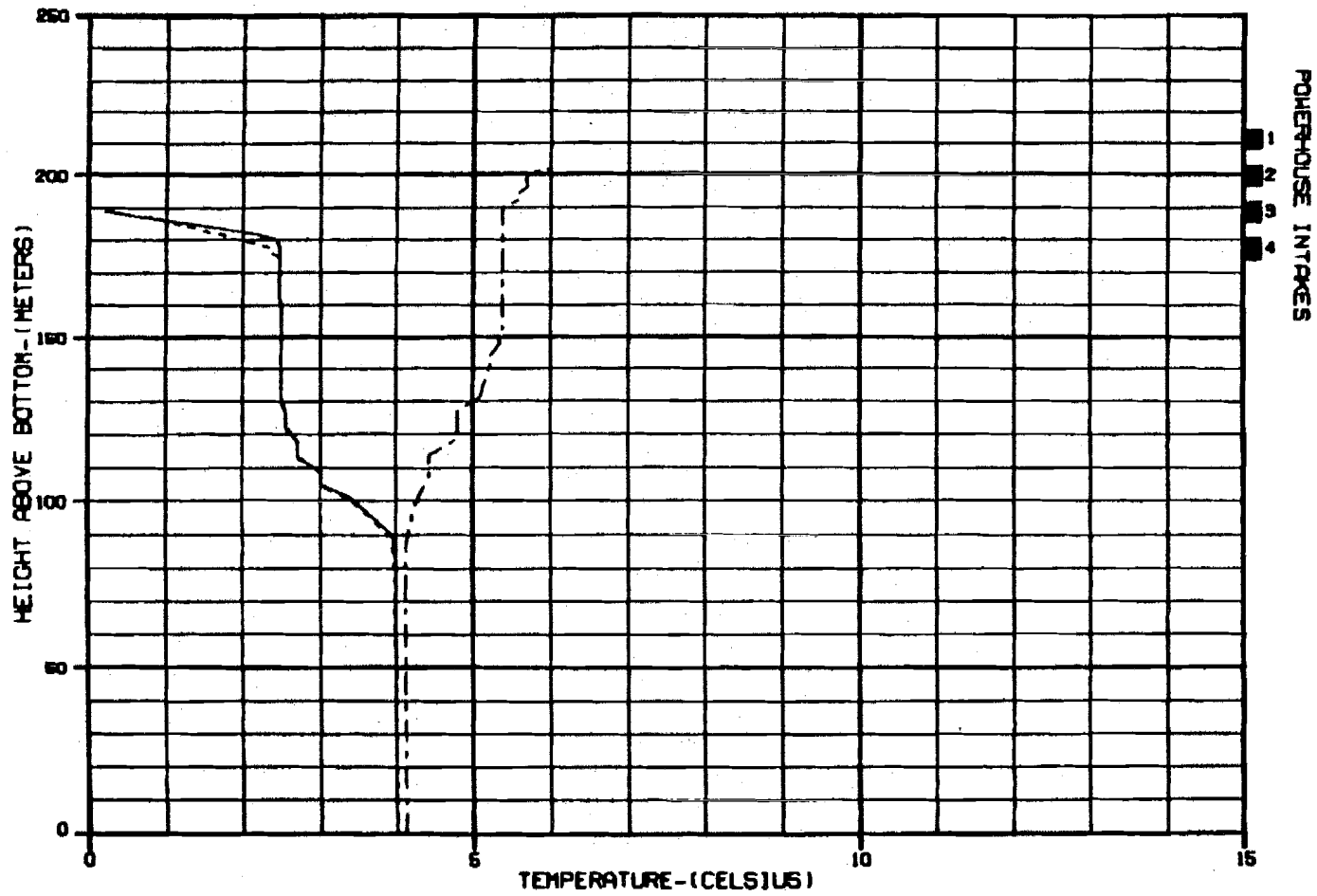
CASE: ■■ WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | FEBRUARY 1971
- | MARCH 1971
- | APRIL 1971

ALASKA POWER AUTHORITY	
DESIGN PROJECT	OPERATION
WATANA RESERVOIR	
TEMPERATURE PROFILES	
WARZA-EBROD JOINT VENTURE	
ORDER: 84-000	7 JAN 84
42-010-04	



POWERHOUSE INTAKES

CASE: WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | MAY 1971
 | JUNE 1971
 - - - - - | JULY 1971

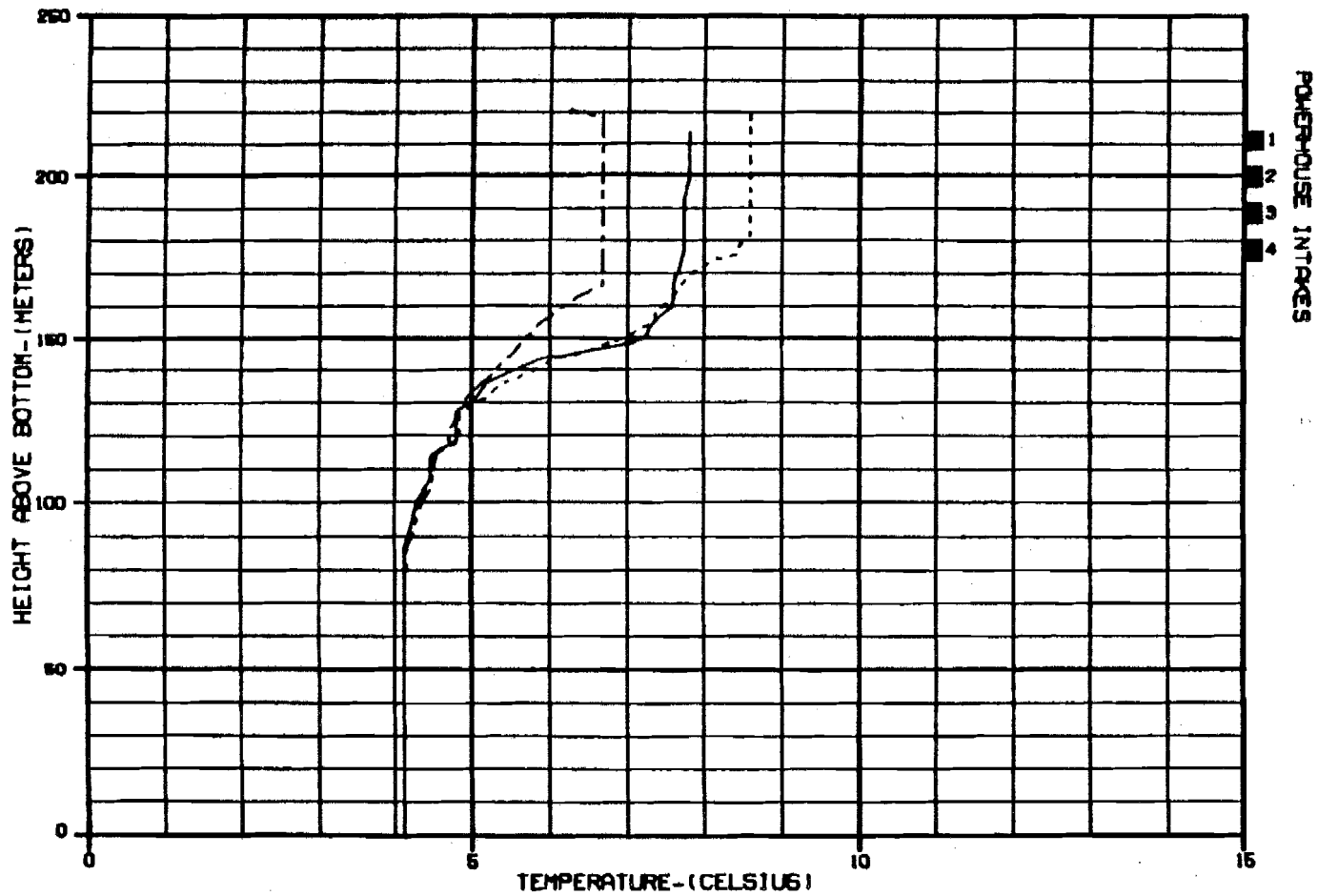
ALASKA POWER AUTHORITY

SUBMITTAL PROJECT OPERATIONAL MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DATE: 11/19/91 7 JAN 94 42-010-04



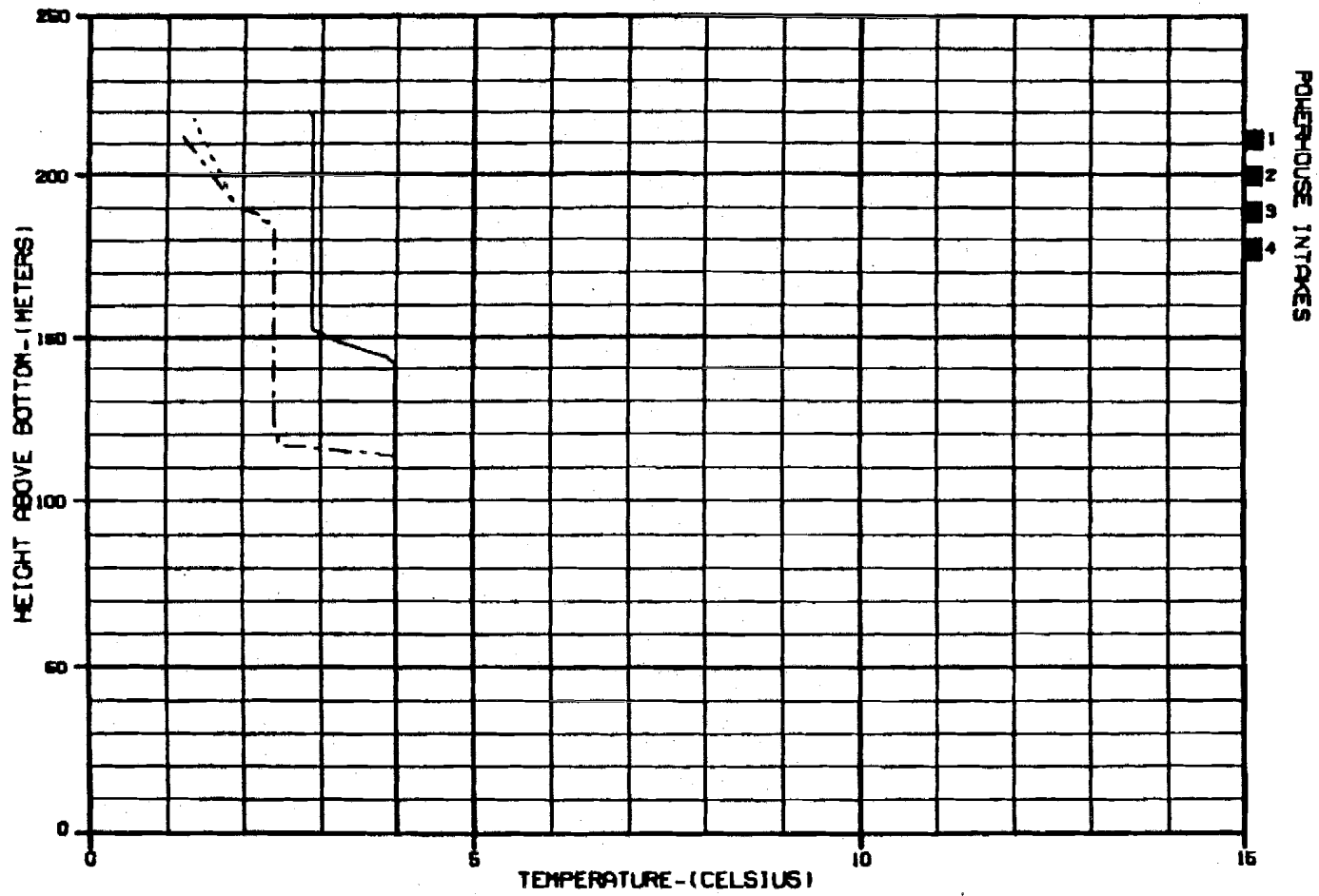
CASE: ■■ WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 AUGUST 1971
- 1 SEPTEMBER 1971
- · - · - 1 OCTOBER 1971

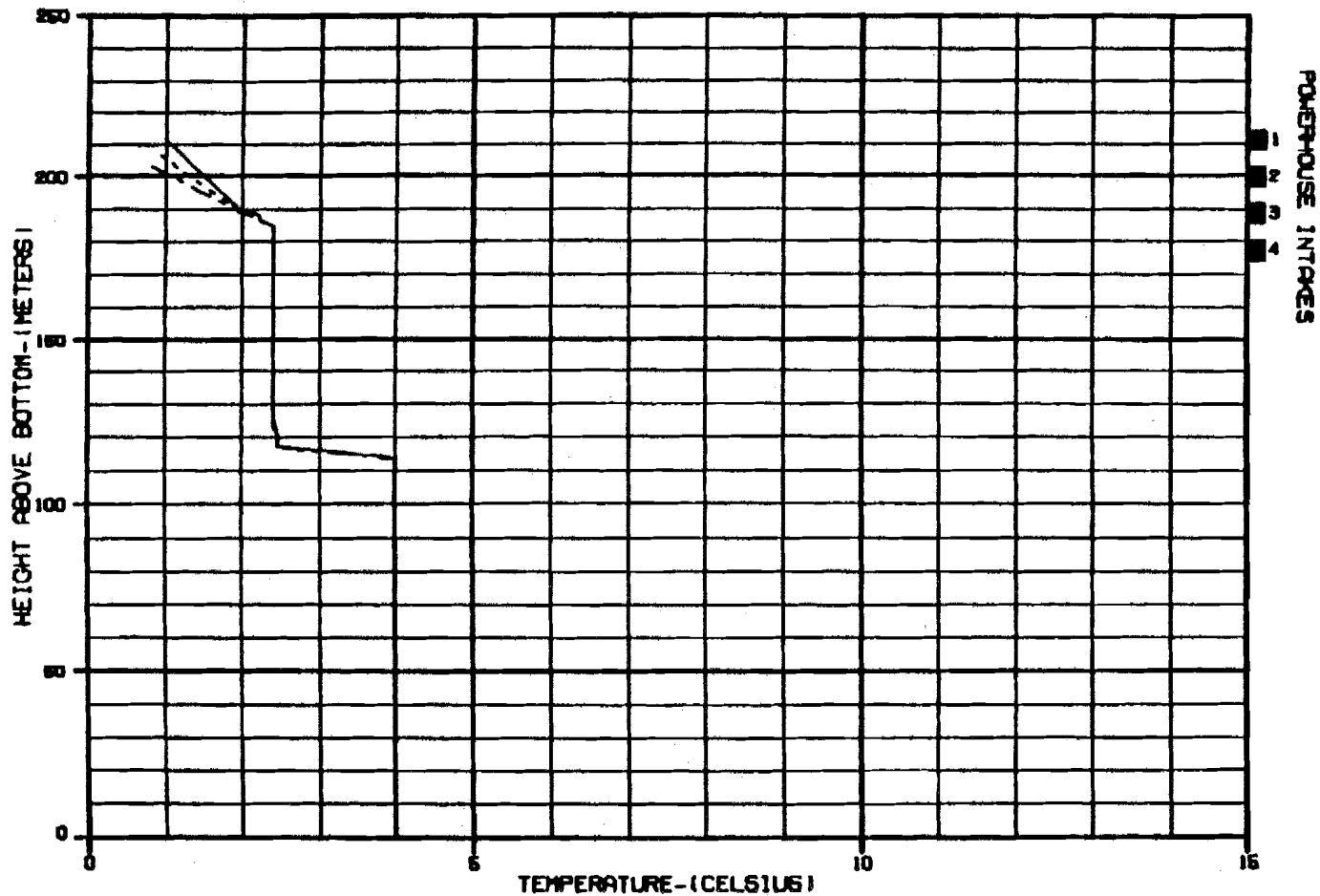
ALASKA POWER AUTHORITY		
OWNER PROJECT	DIVERSION NEEDS	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DESIGNER: BLACK & VEATCH	7 JAN 84	42-010-04



CASE: ■■■ WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1971
 - - - - - | DECEMBER 1971
 - · - · - | JANUARY 1972

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	DRAWING NO.	
WATANA RESERVOIR		
TEMPERATURE PROFILES		
HAZA-EBRACO JOINT VENTURE		
DESIGNED: D.L.D.	7 JAN 84	45-010-04



CASE: WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- - - - - 1 FEBRUARY 1972
 - - - - - 1 MARCH 1972
 - - - - - 1 APRIL 1972

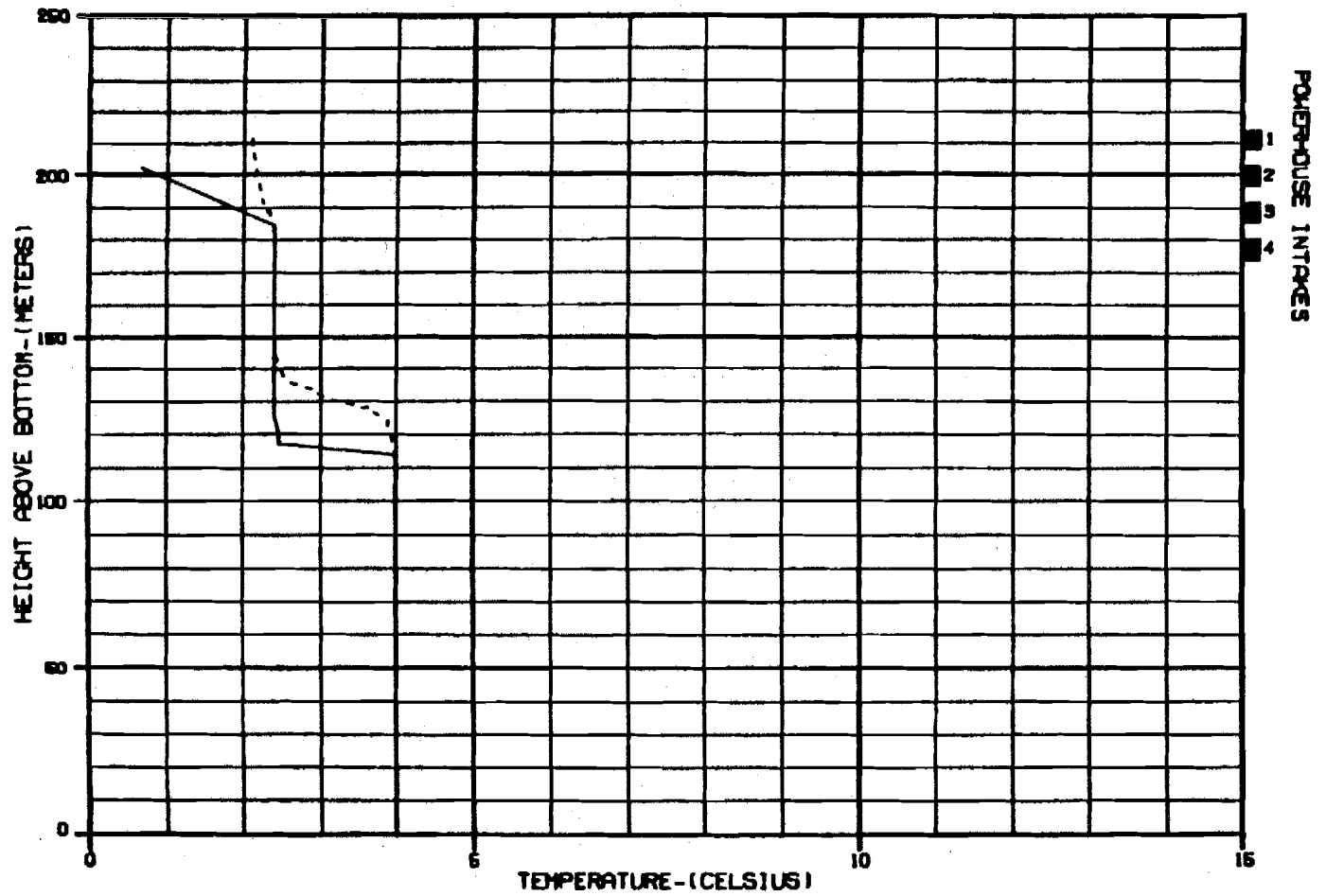
ALASKA POWER AUTHORITY

SUBMITTAL PROJECT DIVERSITY MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-ENERCO JOINT VENTURE

DESIGNED BY: J. J. BROWN T. J. J. J. 42-010-04

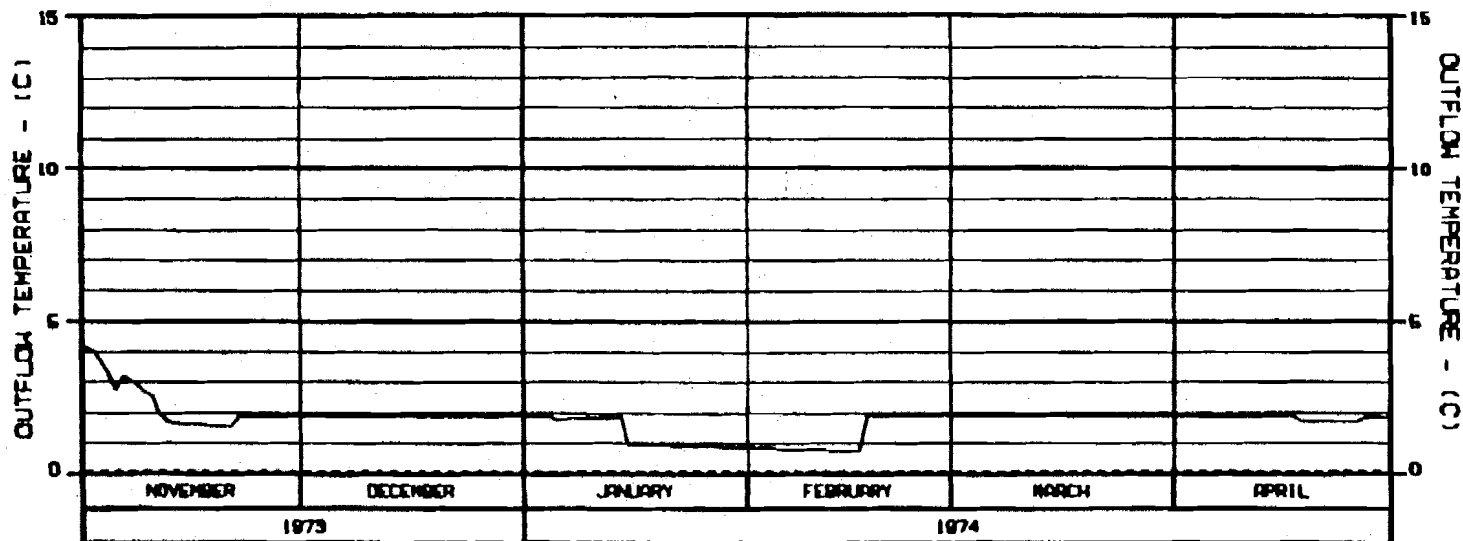
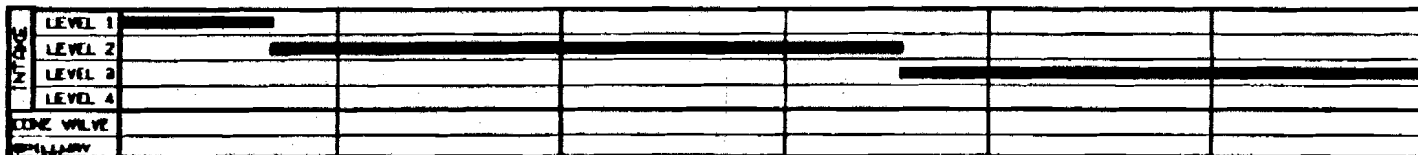
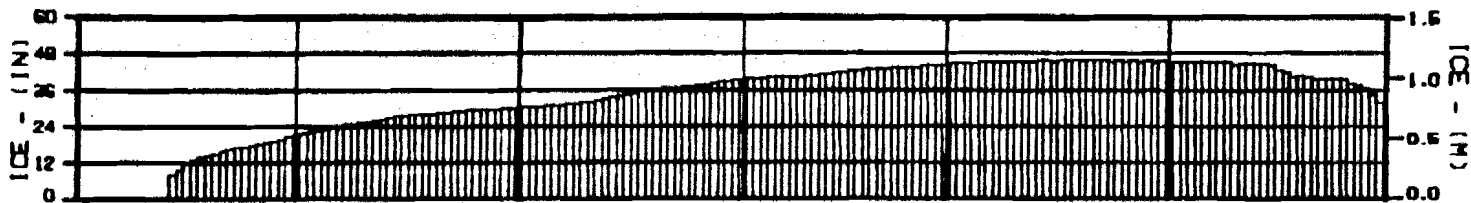


CASE: WA7102A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— MAY 1972
 - - - - JUNE 1972
 JULY 1972

ALASKA POWER AUTHORITY		
DESIGN PROJECT	DWRSH NRES	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DESIGN - EASCO	T. J. W. W.	42-010-04

EXHIBIT AA



LEGEND: CASE: # HA7402A - MATANA OPERATION WITH DEVIL CANYON IN 2002 #

— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.0 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.0 M)
 6. SPILLWAY CREST AT ELEVATION 2140 FT (652.7 M)

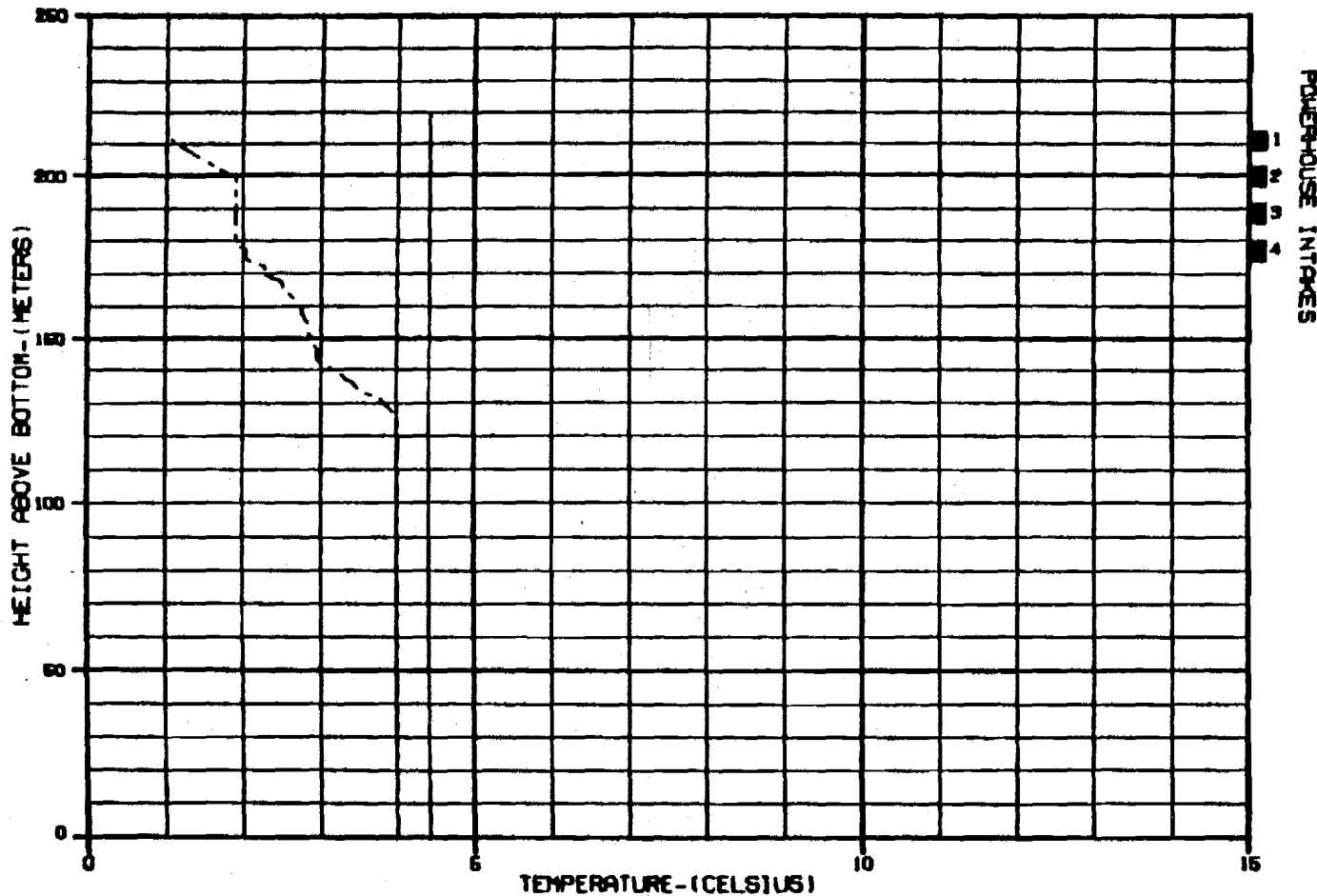
ALASKA POWER AUTHORITY

OWNER PROJECT OPERATOR

MATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HAZRA-EBASCO JOINT VENTURE

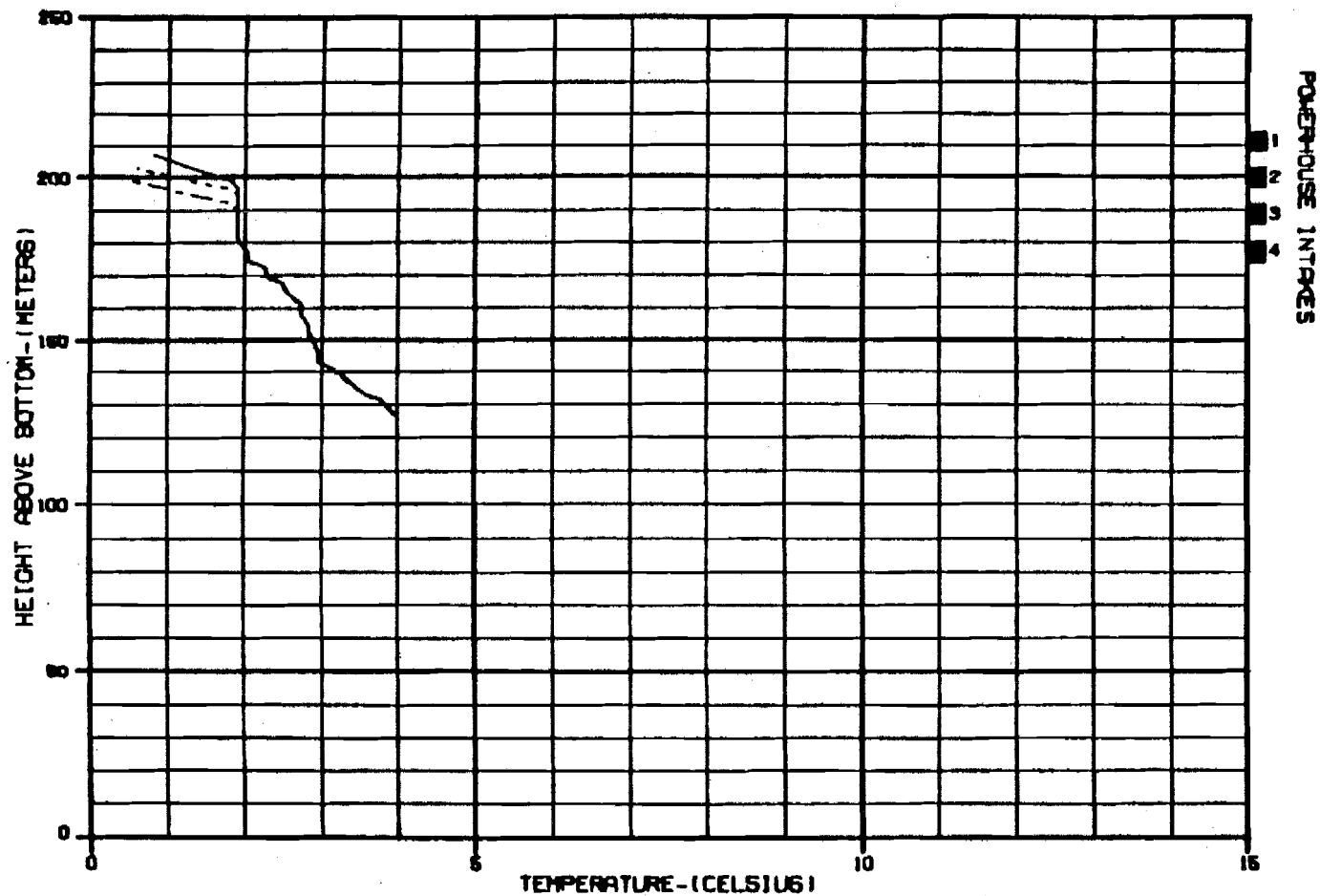
DESIGN: ELLIOTT 7 JAN 84 45-045-04



CAGE: WA7402A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1973
 - - - - | DECEMBER 1973
 - · - · | JANUARY 1974

ALASKA POWER AUTHORITY		
SUBMITTER PROJECT	OPERATION MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBRSCO JOINT VENTURE		
ISSUED: 11/28/73	7 JAN 74	42-010-04



CASE: WA7402A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- FEBRUARY 1974
- - - MARCH 1974
- · - · - APRIL 1974

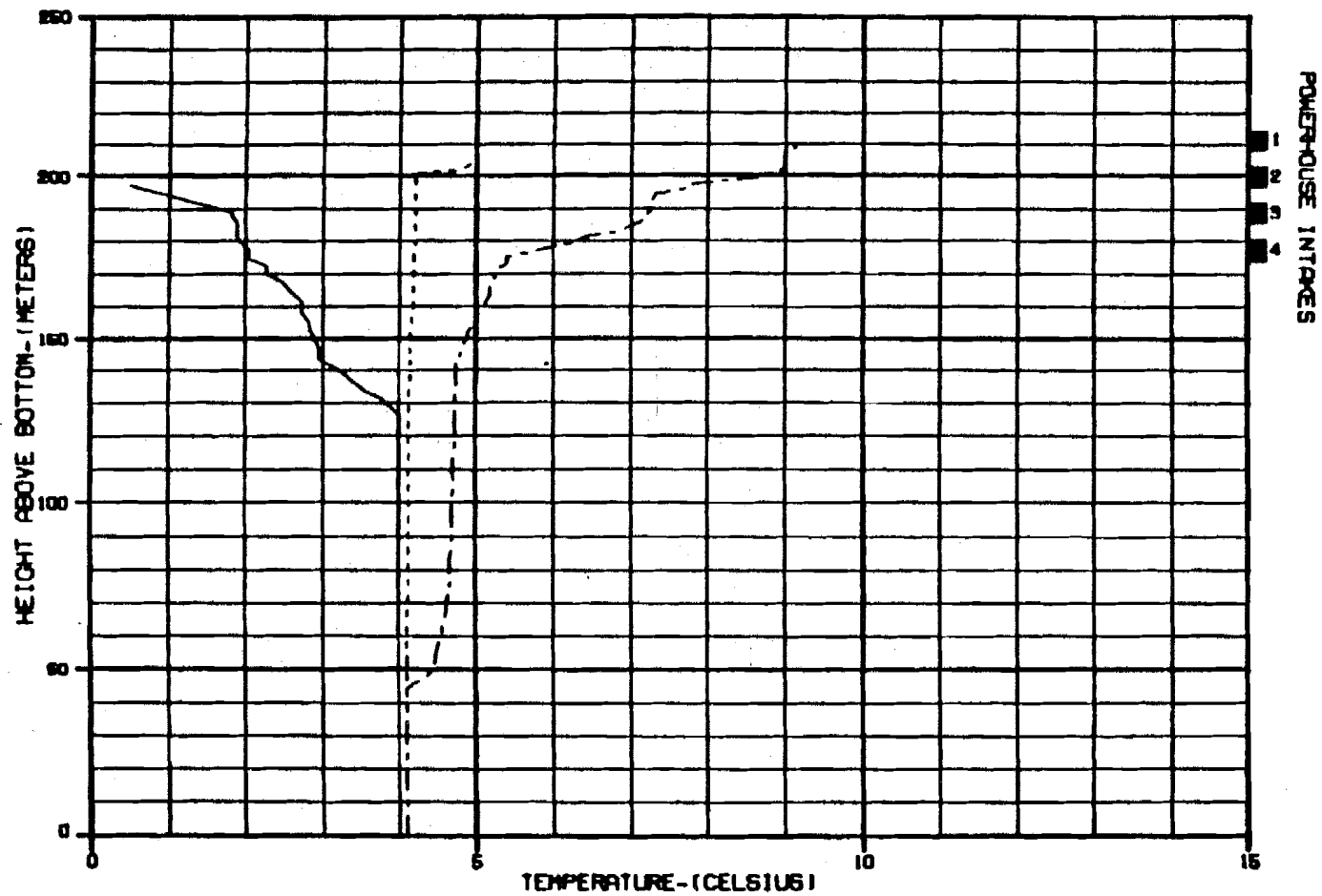
ALASKA POWER AUTHORITY

ELBETHA PROJECT | BRUSHY HILL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRACCO JOINT VENTURE

DATE: 11-08-74 | 42-010-04



CASE: WA7402A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— MAY 1974
 - - - - - JUNE 1974
 - · - · - JULY 1974

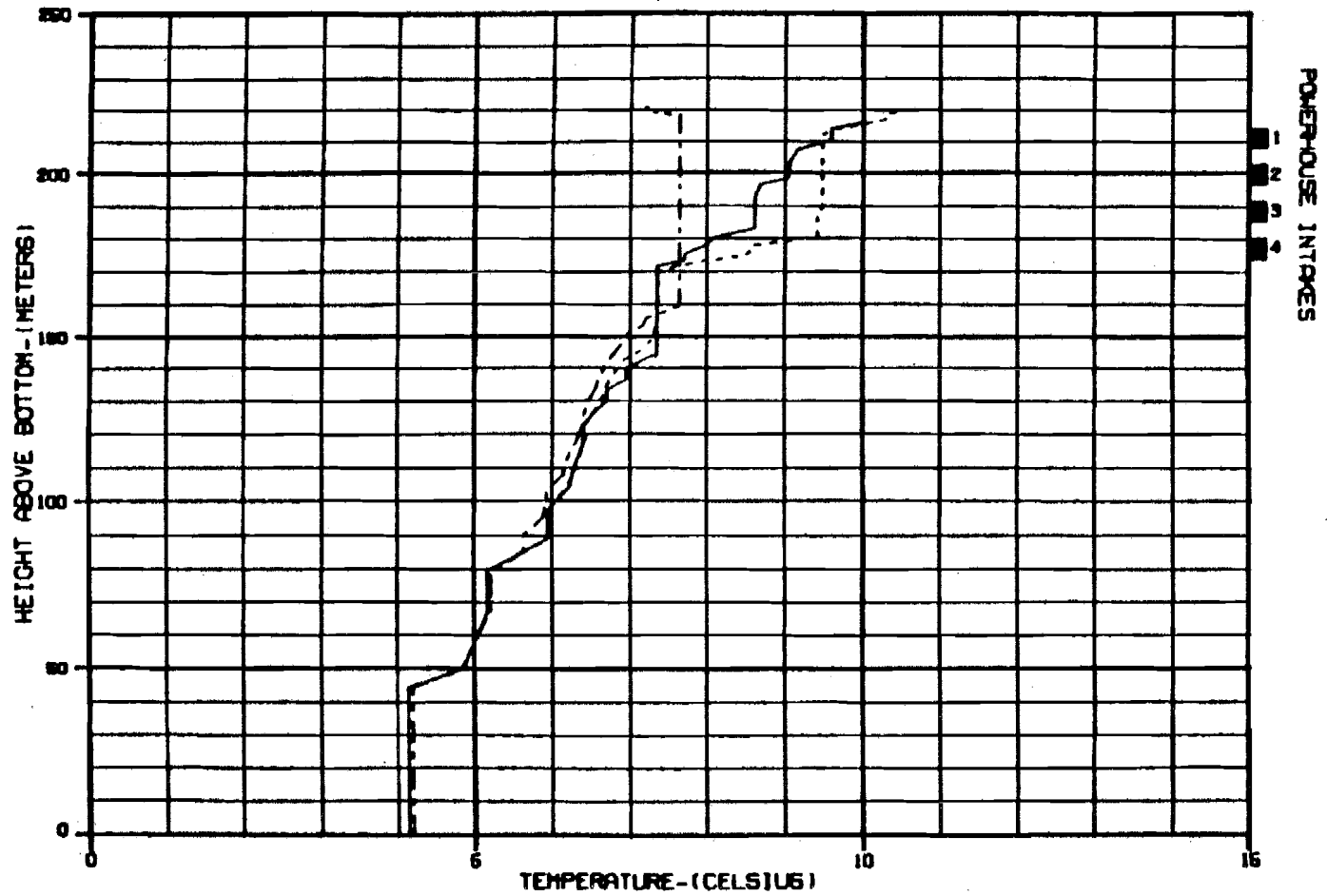
ALASKA POWER AUTHORITY

SUBMITTA PROJECT OPENING MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HAZRA-EBRSCO JOINT VENTURE

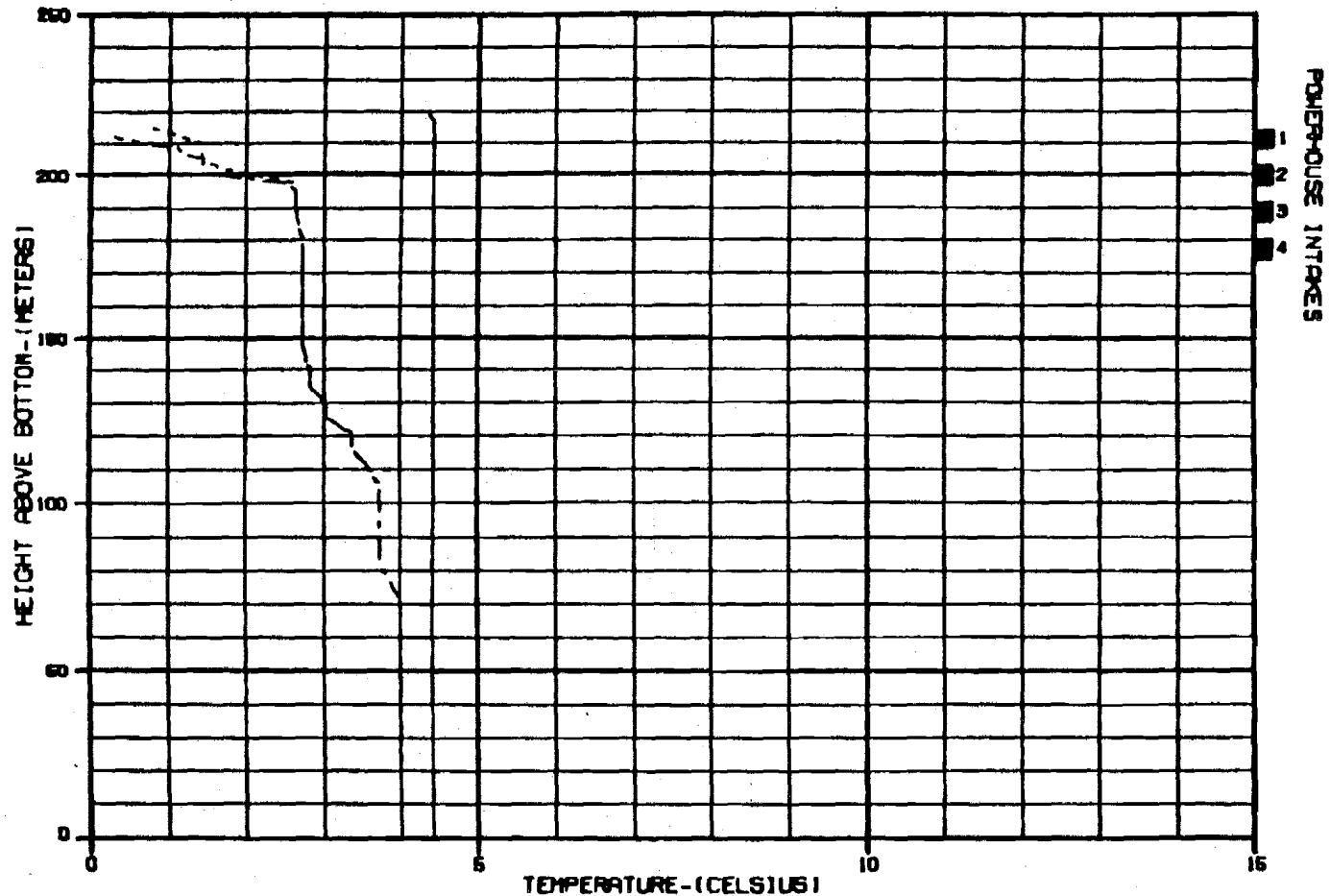
UNIVERSITY OF ALASKA JAN 84 42-010-04



CASE: ■■ WA7402A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ——— 1 AUGUST 1974
 - - - - 1 SEPTEMBER 1974
 - · - · 1 OCTOBER 1974

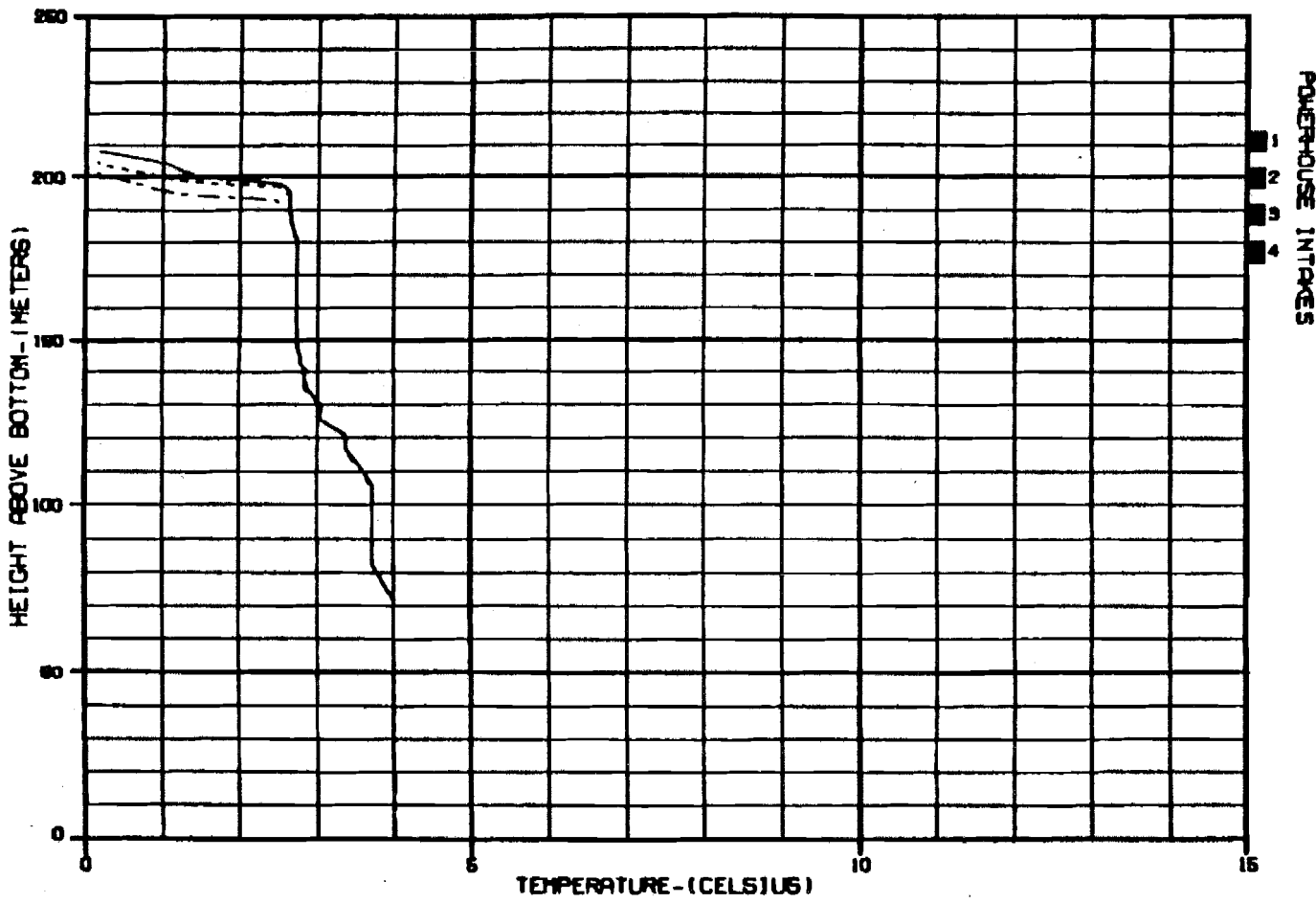
ALASKA POWER AUTHORITY		
DESIGN PROJECT	OWNER/REG.	
WATANA RESERVOIR		
TEMPERATURE PROFILES		
MARZA-EBRACO JOINT VENTURE		
DATE: 11/08/74	BY: JAS/BA	42-010-04



CASE: W7402A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ | NOVEMBER 1974
 - - - - - | DECEMBER 1974
 - - - - - | JANUARY 1975

ALASKA POWER AUTHORITY	
WATANA PROJECT	DEVIL CANYON
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-ERBACD JOINT VENTURE	
ISSUED: 11/19/75	42-020-04



CASE: WA7402A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- FEBRUARY 1975
- MARCH 1975
- - - - - APRIL 1975

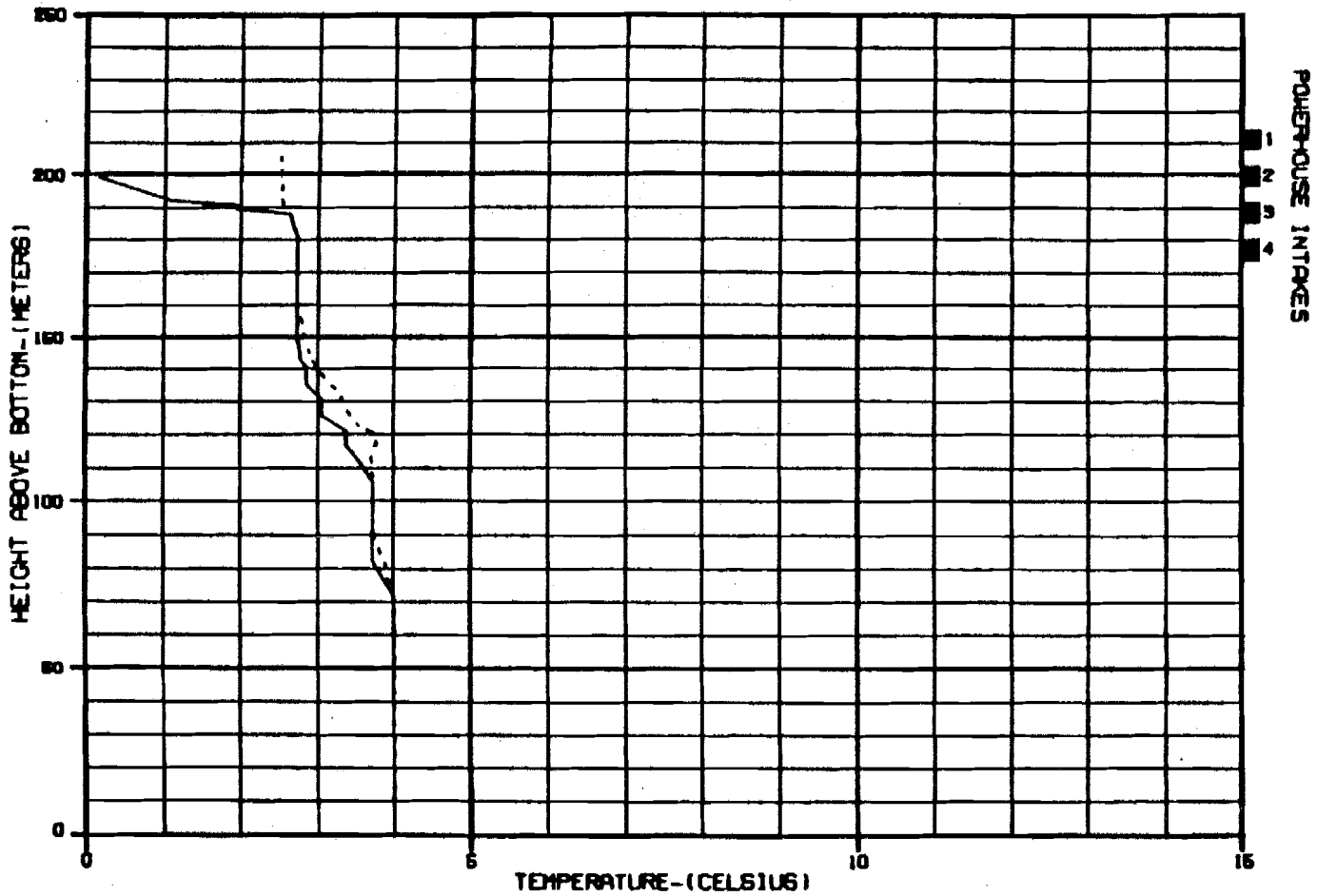
ALASKA POWER AUTHORITY

SUBMITTER PROJECT OFFSHORE MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBRACO JOINT VENTURE

DESIGNER: EBRACO 7 APR 84 42-DIG-04



CASE: ■■ WA7402A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

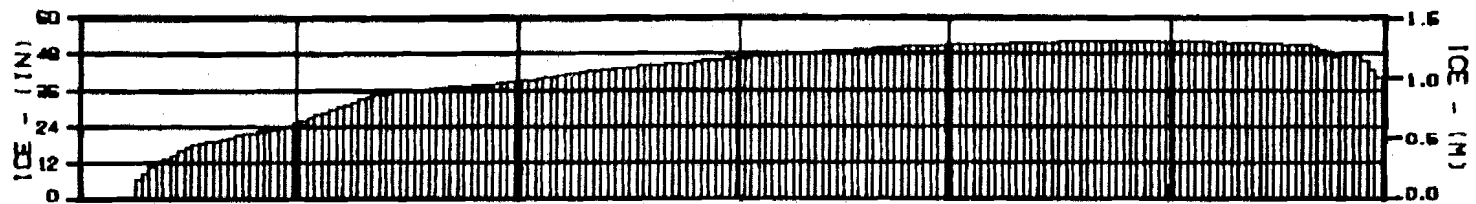
LEGEND:

PREDICTED TEMPERATURE PROFILES:

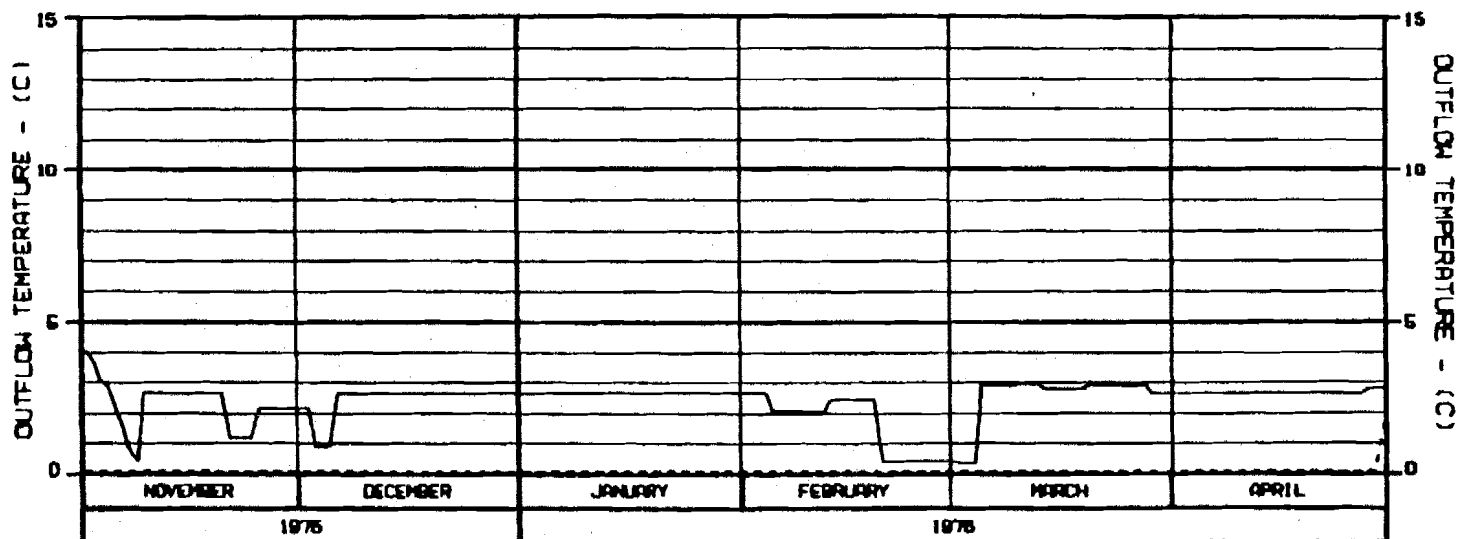
_____ | MAY 1976
 - - - - - | JUNE 1976
 - · - · - | JULY 1976

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	OWNER NAME
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBRISCO JOINT VENTURE	
DESIGNED: S.L. DODD	7 JAN 84
42-010-04	

EXHIBIT AB



INTAKE	LEVEL 1	██████████				
	LEVEL 2		██████████			
	LEVEL 3			██████████		
	LEVEL 4				██████████	
	CONE VALVE					
	SPILLWAY					



LEGEND: CASE: ■■ WA7602A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (658.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

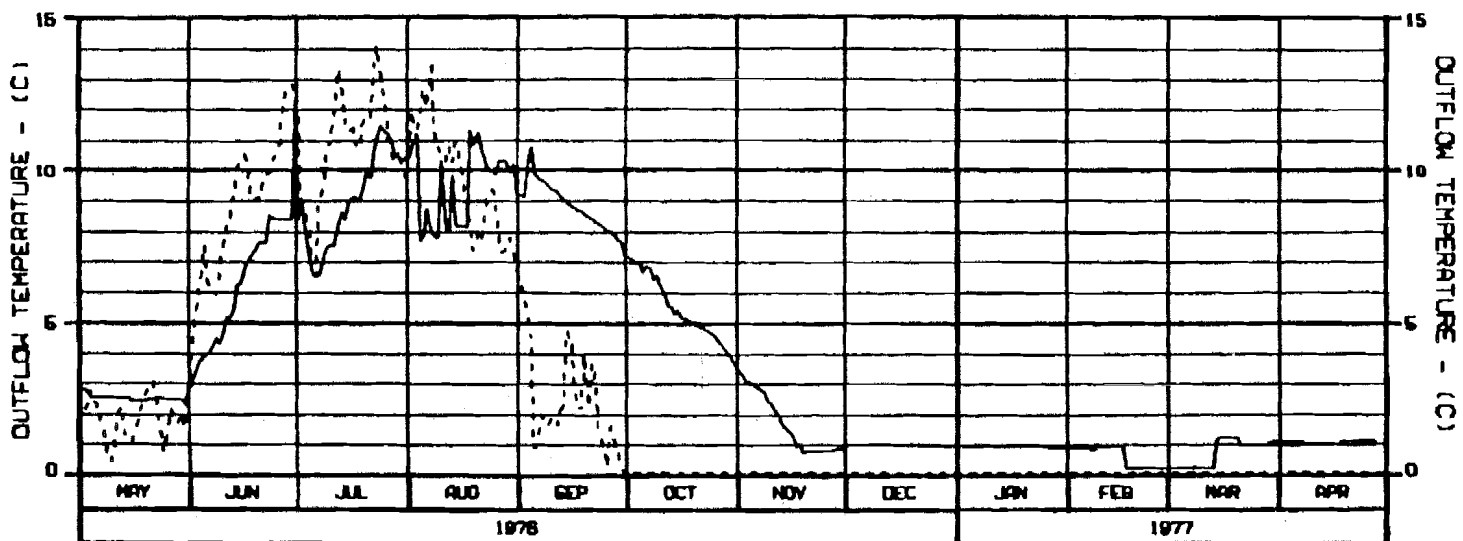
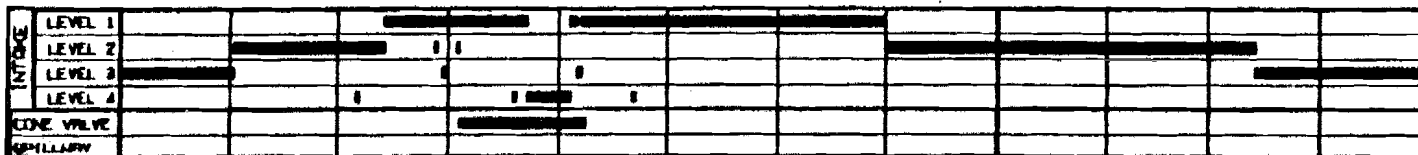
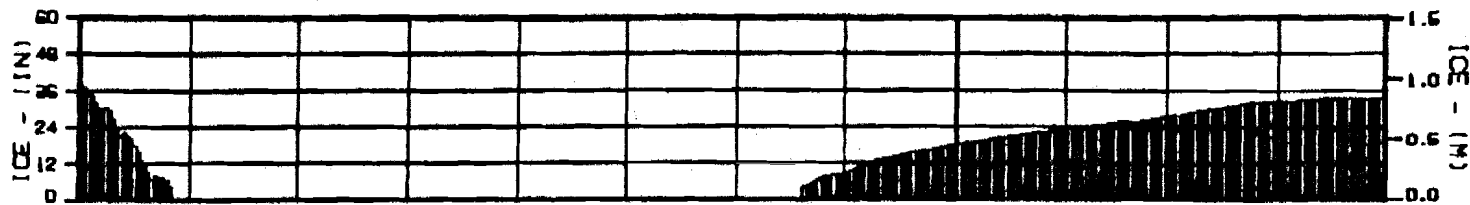
ALASKA POWER AUTHORITY

WATANA PROJECT DYPESH MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBRACO JOINT VENTURE

DESIGN: E.L. PETER 7 JAN 81 49-010-01



LEGEND: CASE: ■ WATANA OPERATION WITH DEVIL CANYON IN 2002 ■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2151 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

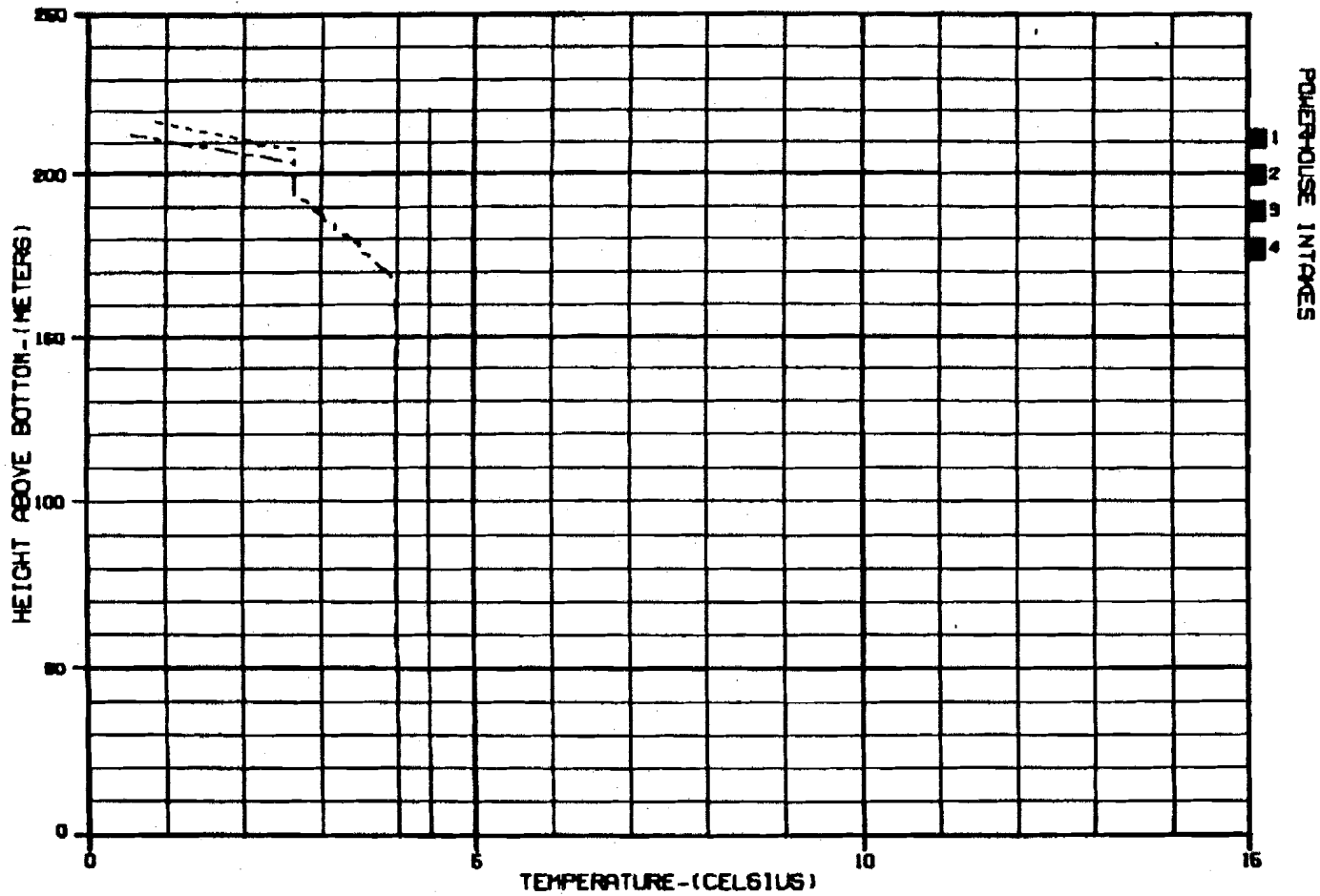
ALASKA POWER AUTHORITY

WATANA PROJECT OWNERS MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

WARZA-EBASCO JOINT VENTURE

BOOKED: 8/1/88 7 JAN 84 48-010-04



CASE: ■■ WA7802A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | NOVEMBER 1976
- | DECEMBER 1975
- - - | JANUARY 1976

ALASKA POWER AUTHORITY

INITIAL PROJECT

OPERATION PERIOD

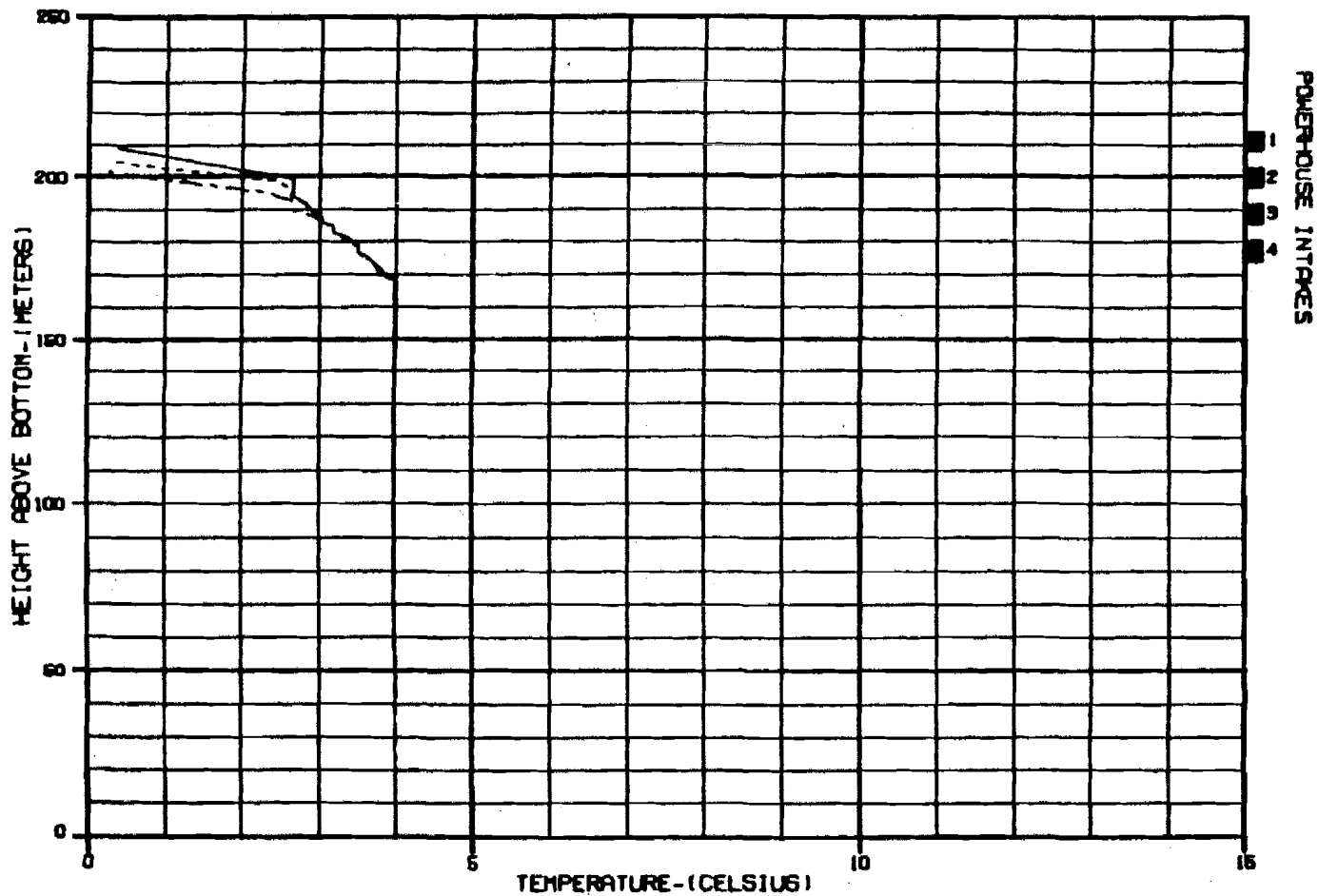
WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-BASED JOINT VENTURE

OWNER: ALASKA

7 JAN 80

42-510-04



CASE: ■■ WA7602A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— | FEBRUARY 1976
 - - - - - | MARCH 1976
 - · - · - | APRIL 1976

ALASKA POWER AUTHORITY

GENERATOR PROJECT

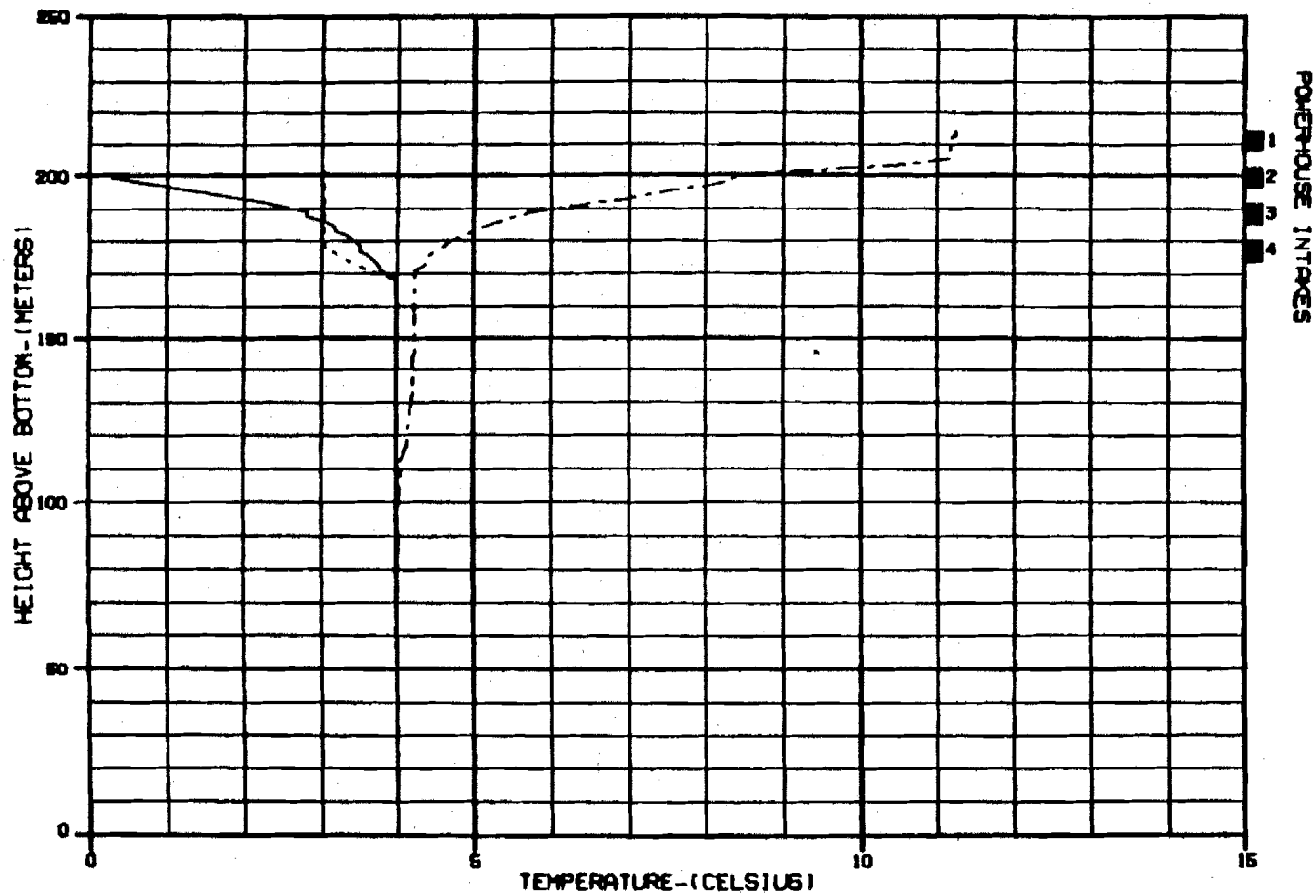
OPERATION MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

ISSUED: 01/08/88 7:48 AM

42-010-04



CASE: ■■ WA7602A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 MAY 1976
 - - - - - 1 JUNE 1976
 - · - · - 1 JULY 1976

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

GREEN VEDEL

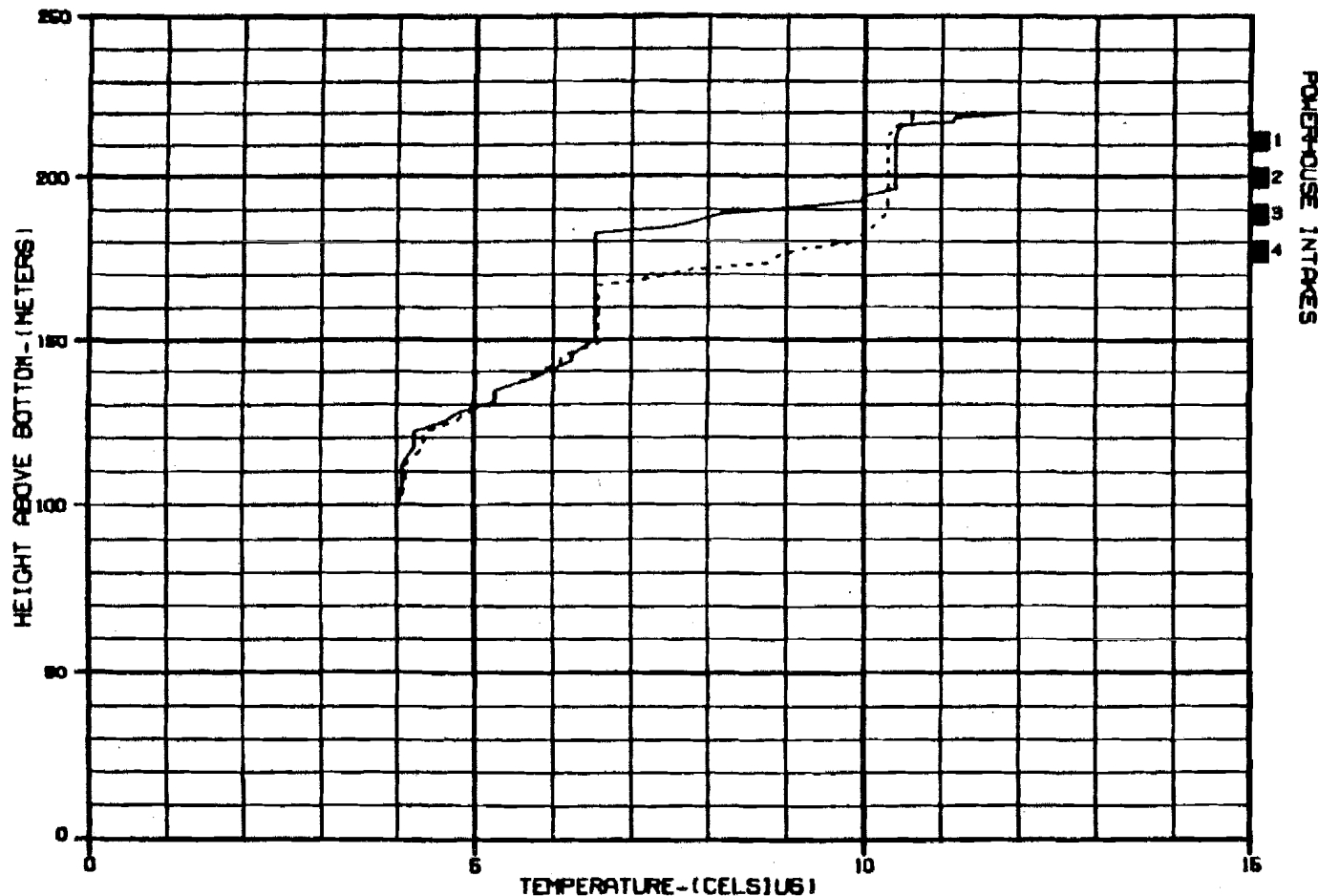
WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBR600 JOINT VENTURE

OWNER: ALASKA

7 JAN 84

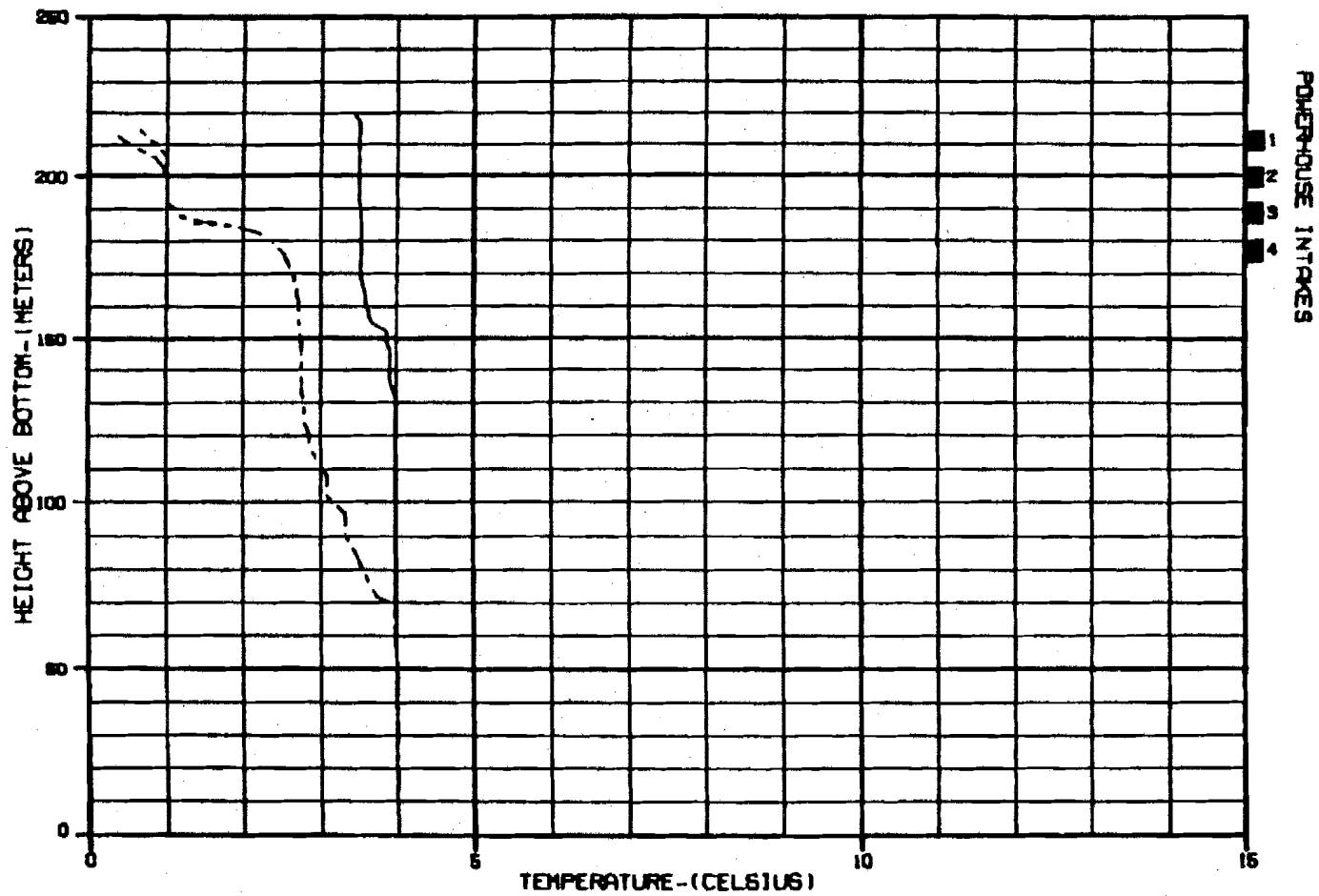
48-010-04



CASE: WA7602A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | AUGUST 1976
 | SEPTEMBER 1976
 - - - - | OCTOBER 1976

ALASKA POWER AUTHORITY	
SUBJECT PROJECT	OWNER/USER
WATANA RESERVOIR TEMPERATURE PROFILES	
WARDA-EBASCO JOINT VENTURE	
DESIGNED BY/DATE	42-010-04



CASE: ■■ WA7802A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1976
- 1 DECEMBER 1976
- · - · - 1 JANUARY 1977

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

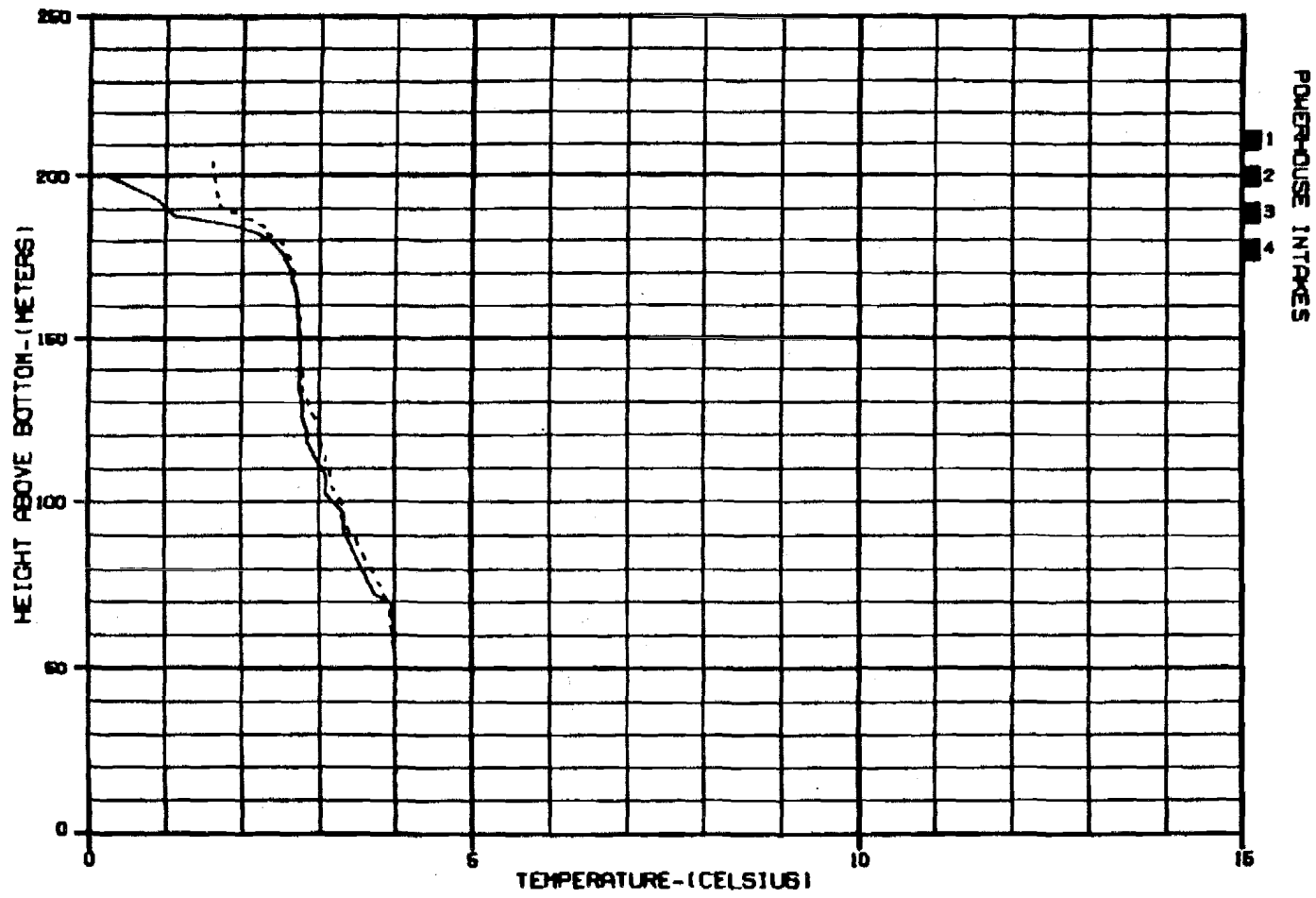
DRAWING NO.

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRACD JOINT VENTURE

DESIGN: R.L.D. 7 JAN 77

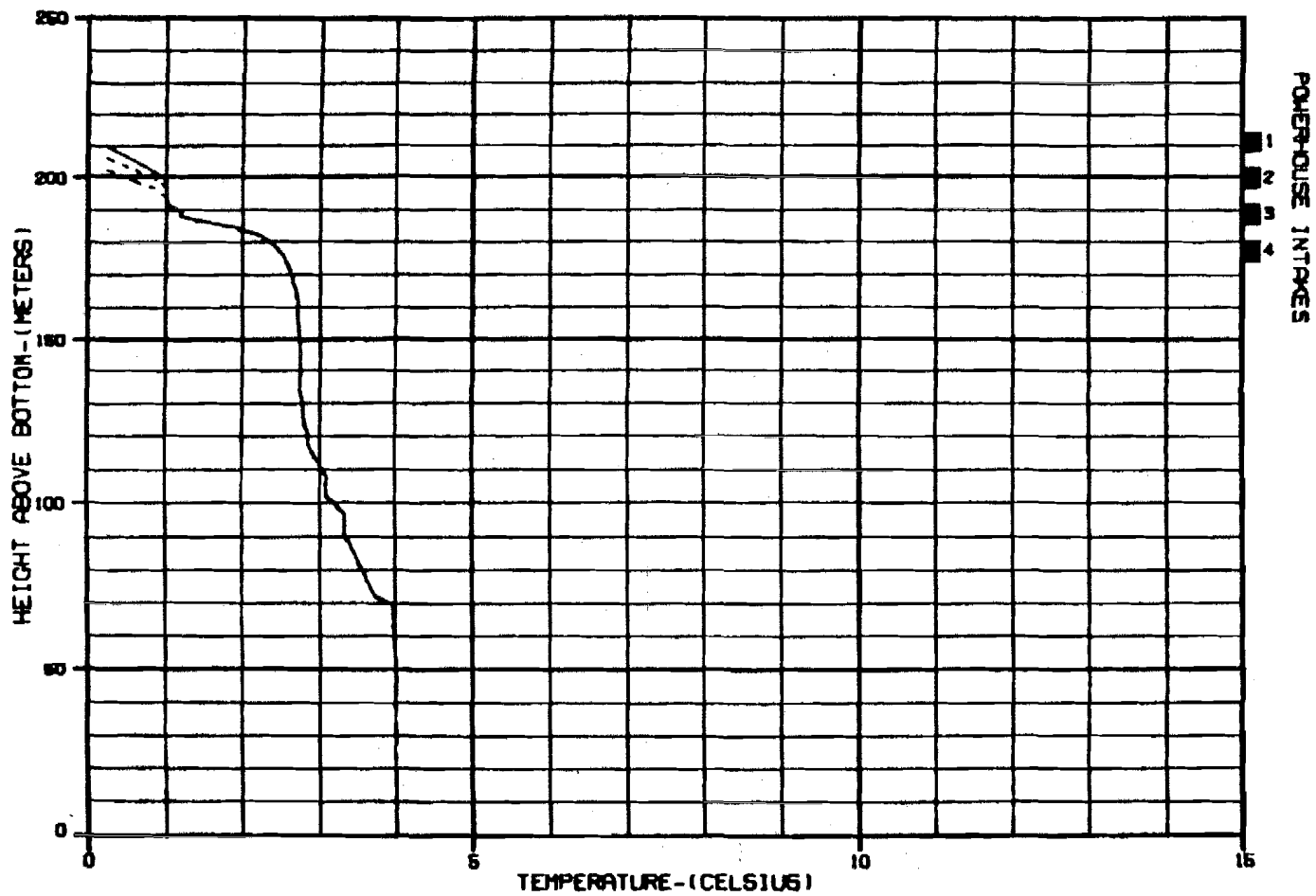
42-018-04



CASE: ■■ WA7602A - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ | MAY 1977
 - - - - - | JUNE 1977
 - · - · - | JULY 1977

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	DRAWN FILE
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
PROJECT NUMBER	DATE
WA 7602A	10-01-04



CASE: WA7602A - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— 1 FEBRUARY 1977
 - - - - - 1 MARCH 1977
 - · - · - 1 APRIL 1977

ALASKA POWER AUTHORITY

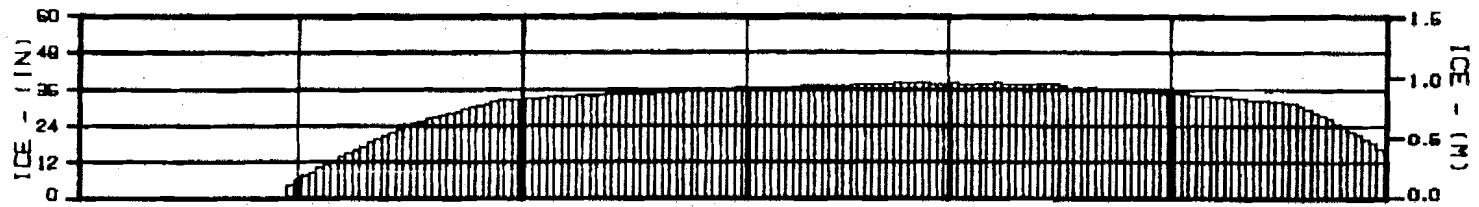
SUBMITTA PROJECT DYNEM MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

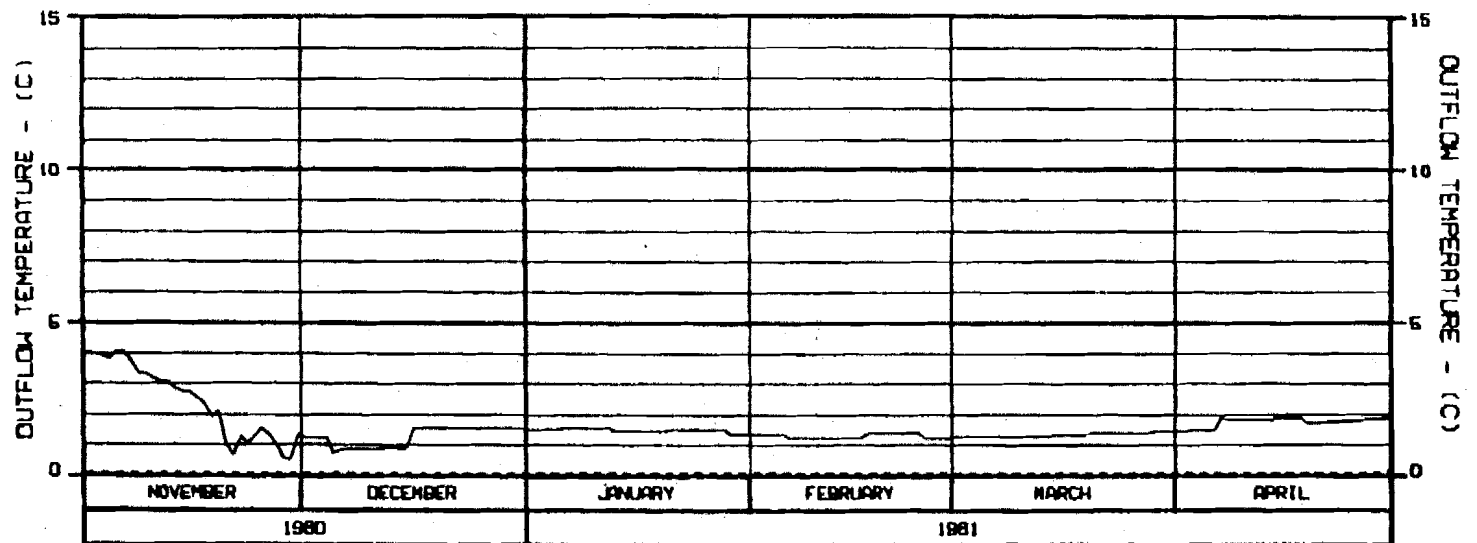
WARZA-EBR600 JOINT VENTURE

DESIGN: ALBERT T. JENKINS 42-010-04

EXHIBIT AC



INTAKE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	CONE VALVE	SPILLWAY
	████████████████████	██	██	██		

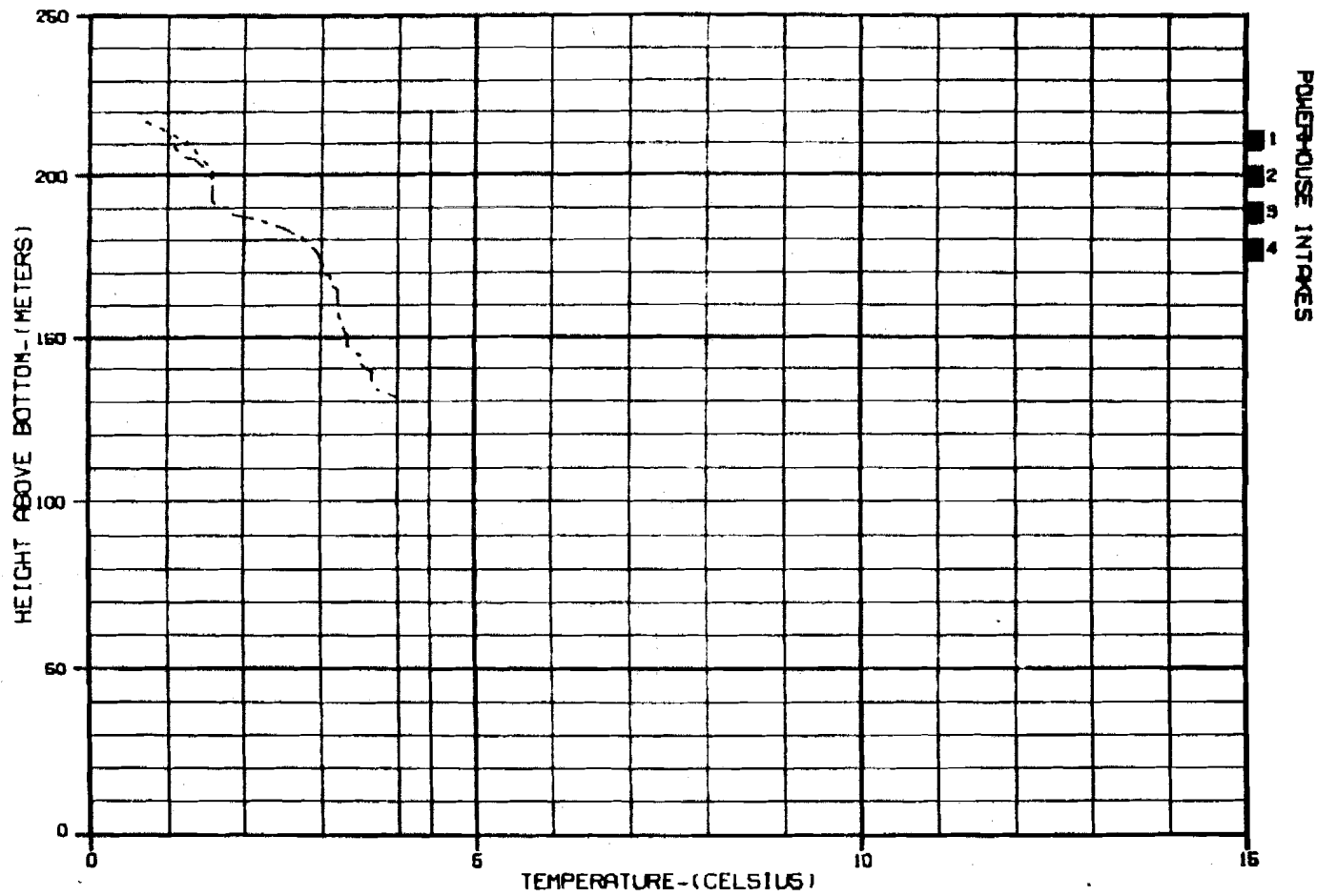


LEGEND: CASE: ■■ WAB1821029 - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.8 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.8 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

ALASKA POWER AUTHORITY	
SUBTINA PROJECT	DYNEMH MODEL
WATANA RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH	
HARZA-EBASCO JOINT VENTURE	
DRAWN: S.L.P.88	1 JAN 89
48-010-04	



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:
 — NOVEMBER 1980
 - - - DECEMBER 1980
 - · - · JANUARY 1981

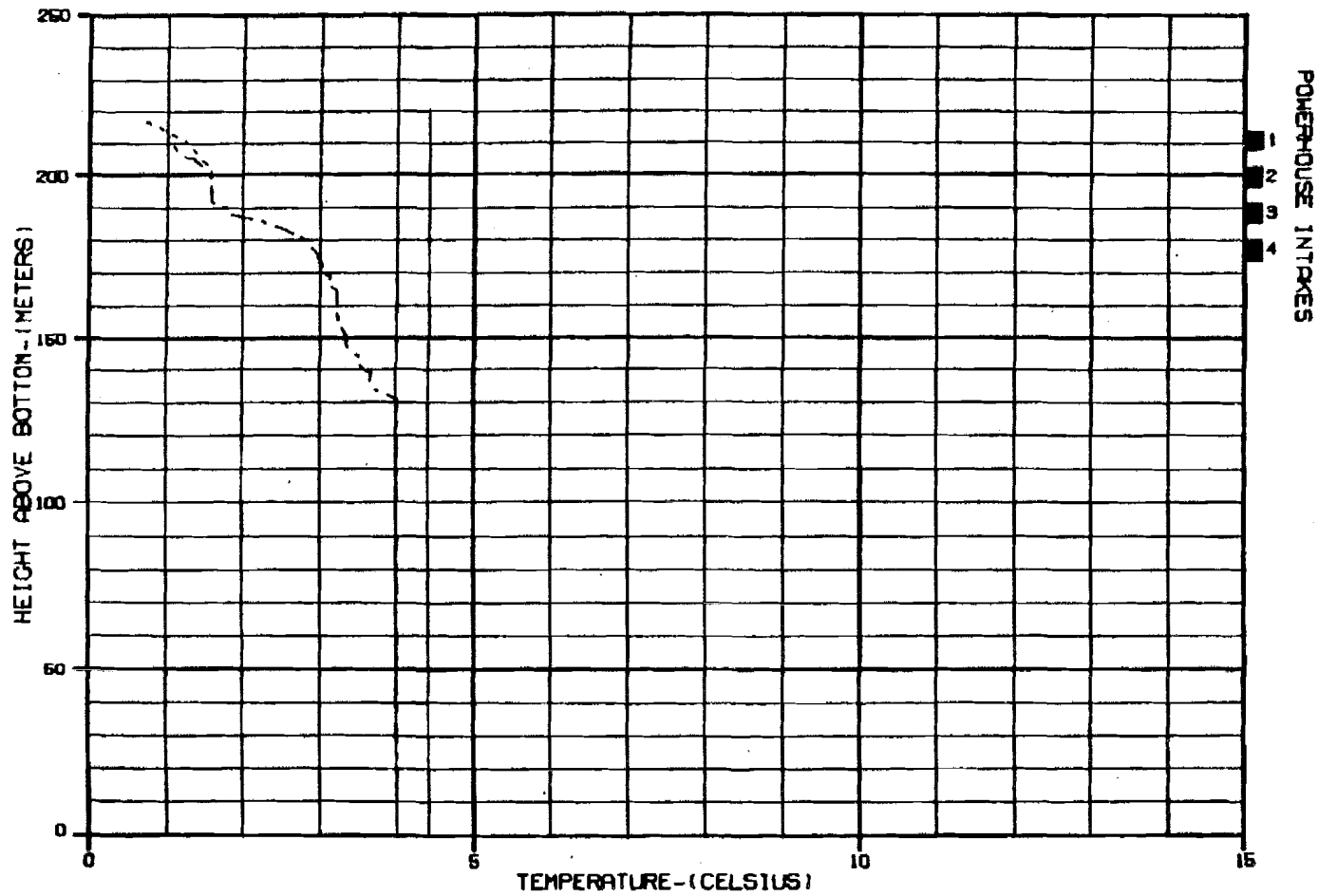
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DESIGN MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EGASCO JOINT VENTURE

CHANGES: ALL PAGES 1 JAN 81 22-010-04



CASE: WAB11B2102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 NOVEMBER 1980

..... 1 DECEMBER 1980

- - - - 1 JANUARY 1981

ALASKA POWER AUTHORITY

SUBMITTA PROJECT OVERSEER MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

GEORGE ALLENBY 1 JAN 81 42-010-04



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 FEBRUARY 1981
- - - 1 MARCH 1981
- · - · 1 APRIL 1981

ALASKA POWER AUTHORITY

SUBTINA PROJECT

DYKEM MODEL

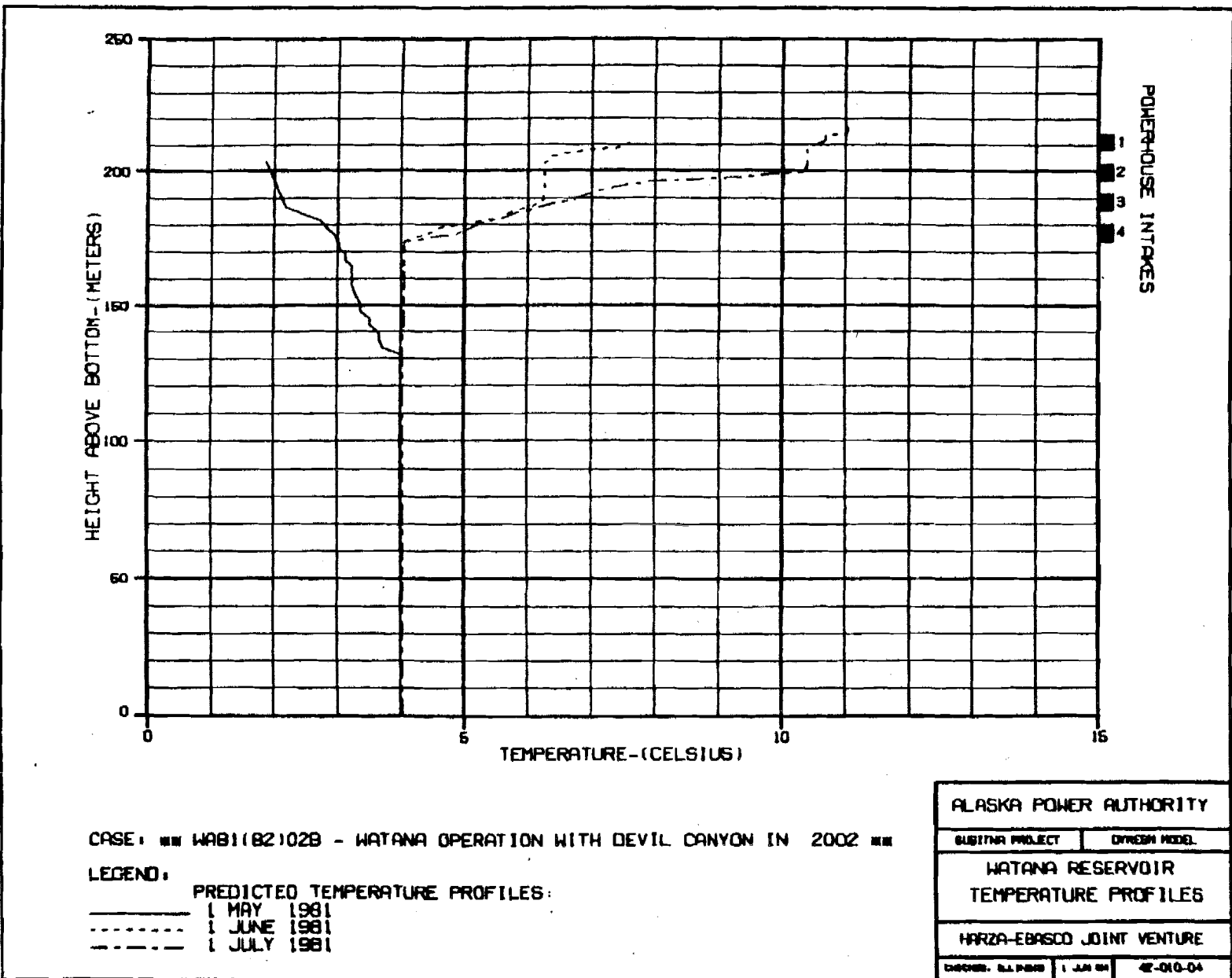
WATANA RESERVOIR
TEMPERATURE PROFILES

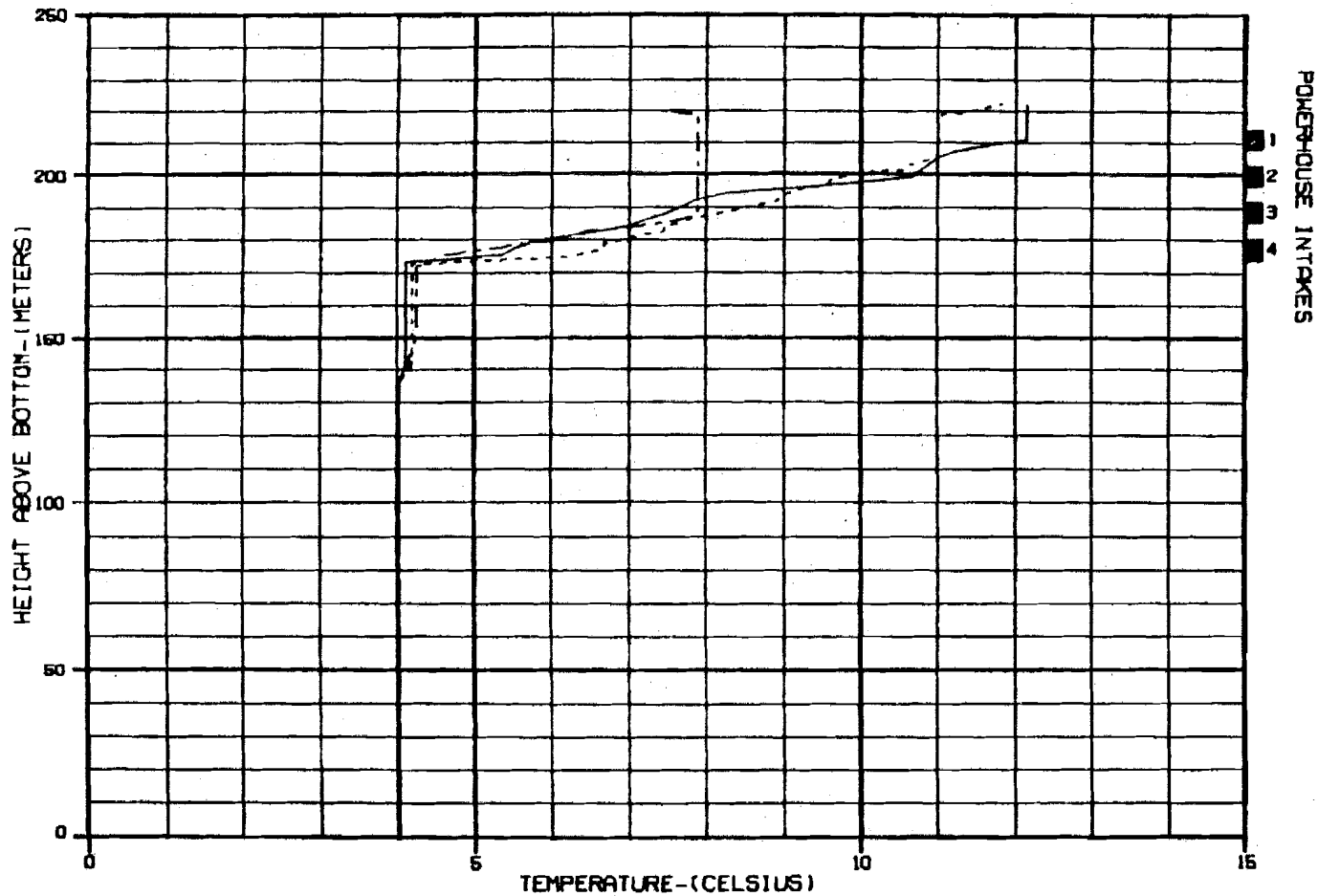
HARZA-EBASCO JOINT VENTURE

DESIGN: BL/MS

1 JAN 84

42-010-04





CASE: ■■ WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— | AUGUST 1981
 - - - - | SEPTEMBER 1981
 - · - · - | OCTOBER 1981

ALASKA POWER AUTHORITY

WATANA PROJECT

OPENSI MODEL

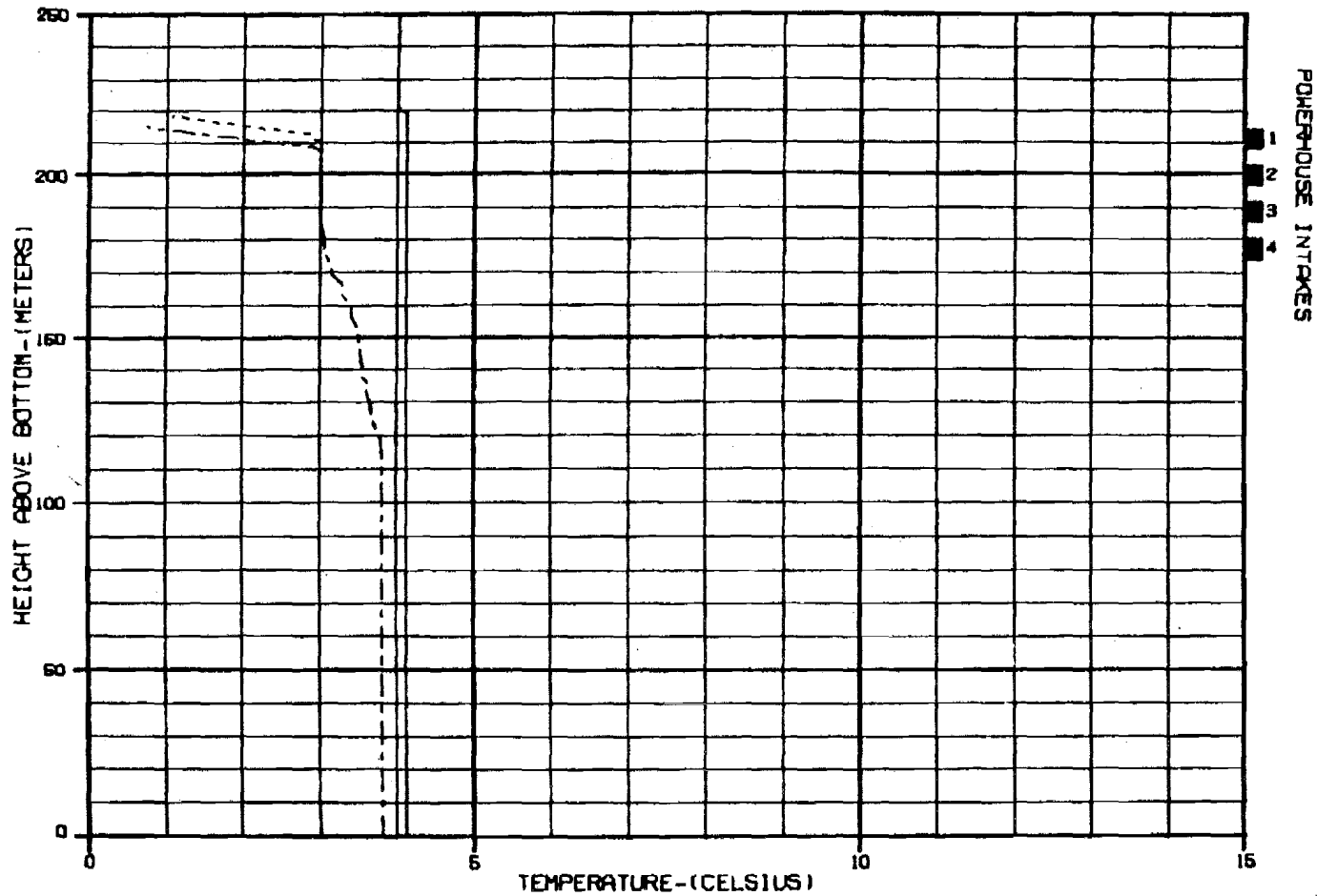
WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

OWNER: ALPAB

1 JAN 81

42-010-04



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1981
- - - 1 DECEMBER 1981
- · - · 1 JANUARY 1982

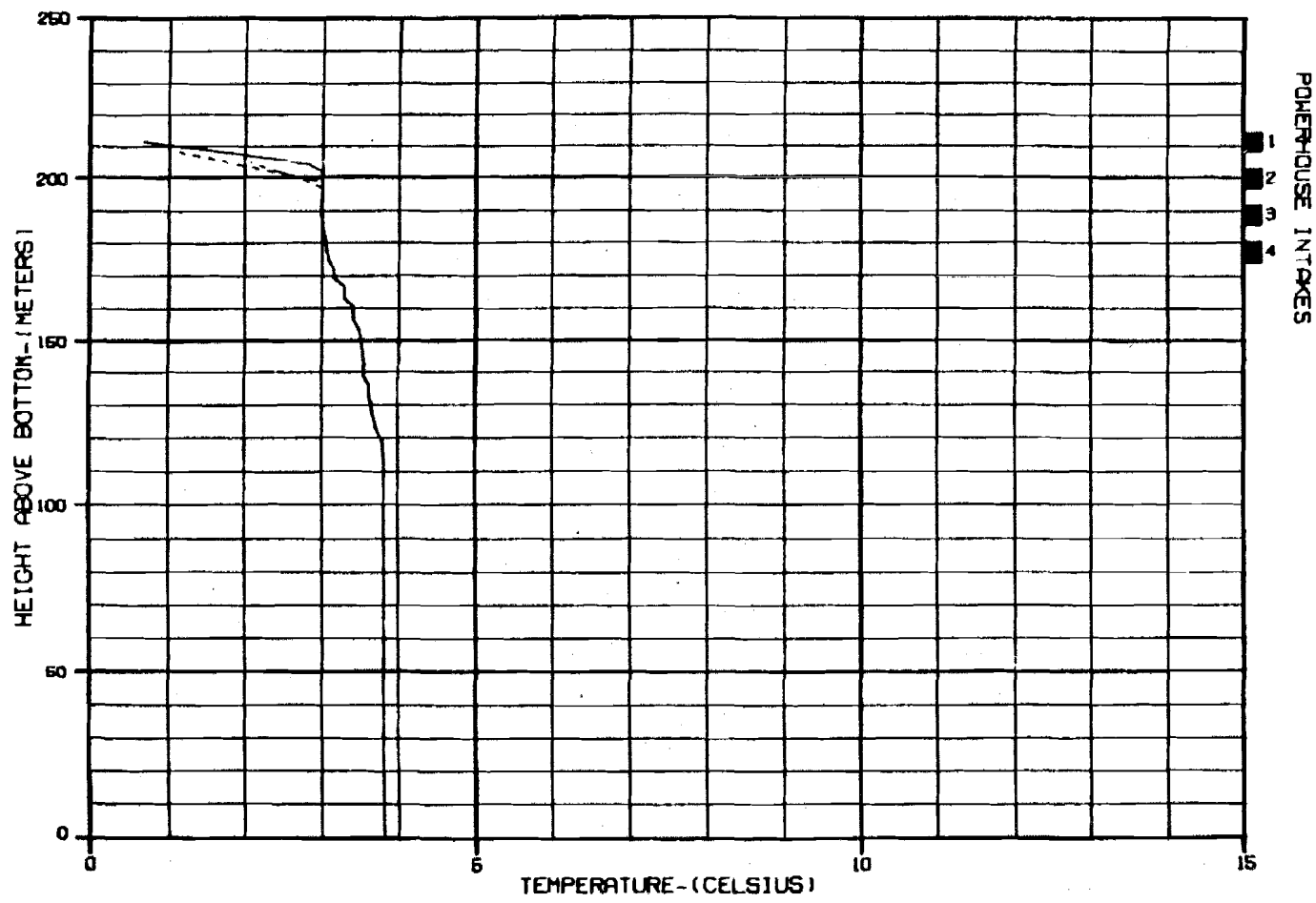
ALASKA POWER AUTHORITY

WATANA PROJECT DYWIDAG MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EDBSCO JOINT VENTURE

ENCLOSURE 1 JAN 84 42-010-04

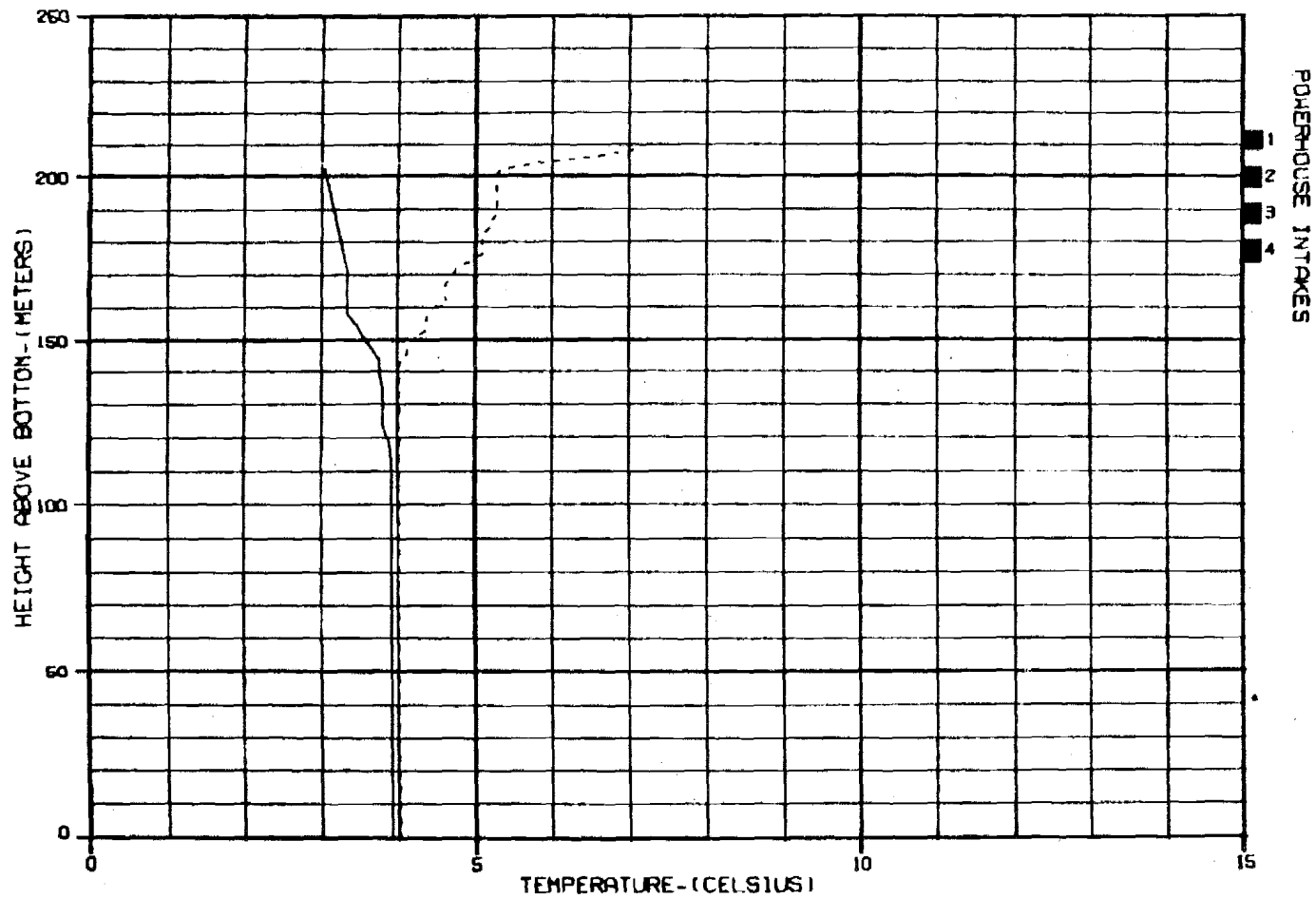


CASE: ■■ WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002 ■■

LEGEND, PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1982
 - - - - | MARCH 1982
 - · - · | APRIL 1982

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	DYWIDOP MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
HARZA-EBRACCO JOINT VENTURE		
CHICAGO, ILLINOIS	1 JAN 84	42-010-04

EXHIBIT AD



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES

— MAY 1983
 - - - JUNE 1983

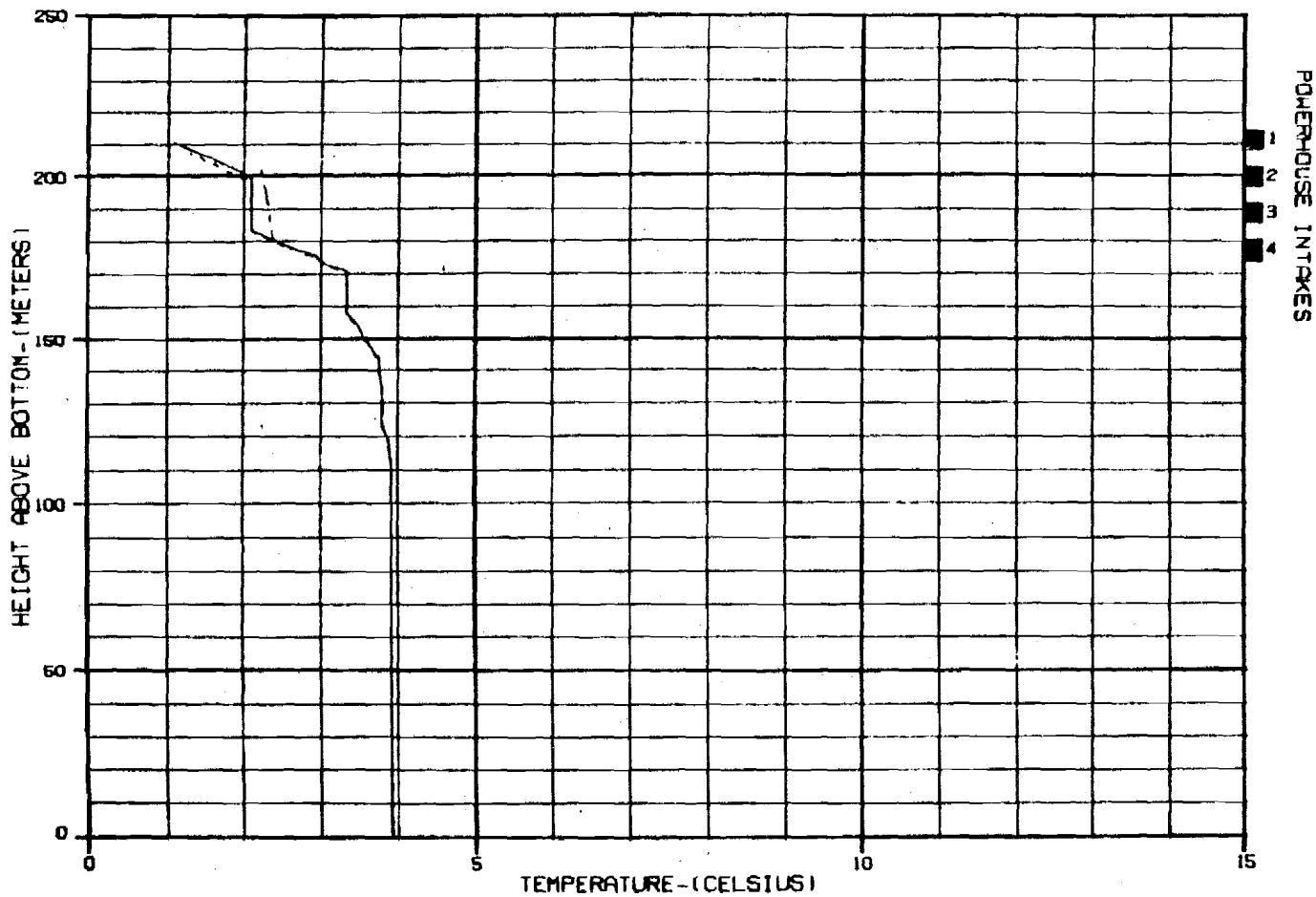
ALASKA POWER AUTHORITY

SUBITMA PROJECT DYNEM MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHECKED: B.L. DREYER 1 JAN 84 42-010-04



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 FEBRUARY 1983
- - - 1 MARCH 1983
- · - · 1 APRIL 1983

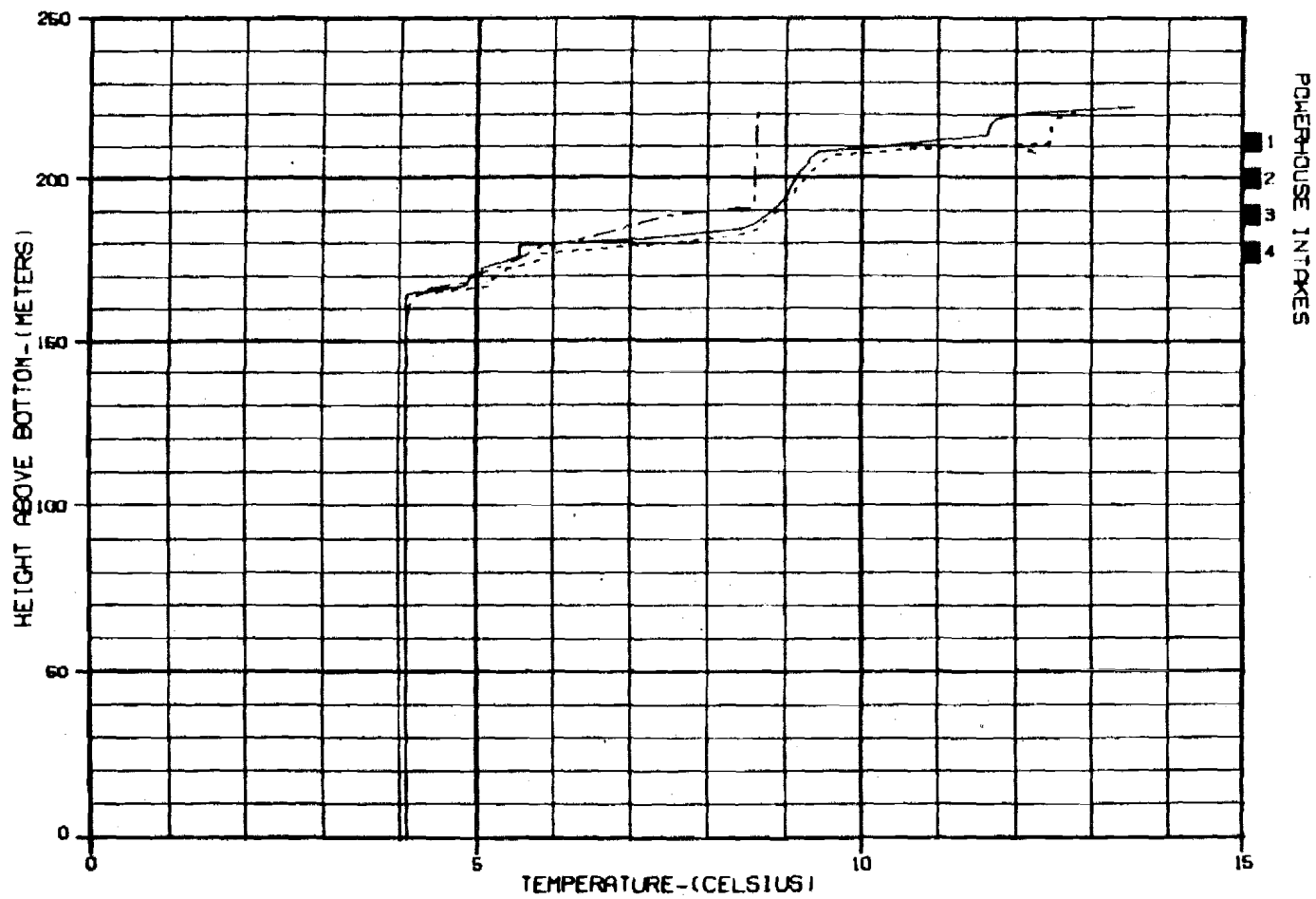
ALASKA POWER AUTHORITY	
SUBITNA PROJECT	DYNOSH MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
ENGINEER - ILL. IN 818	1 JAN 84 42-010-04



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— 1 NOVEMBER 1982
 - - - - 1 DECEMBER 1982
 - · - · 1 JANUARY 1983

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	DYNEM MODEL	
WATANA RESERVOIR		
TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
CHONG - OLSEN	1 JAN 83	42-010-04



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 AUGUST 1982
- - - 1 SEPTEMBER 1982
- · - · 1 OCTOBER 1982

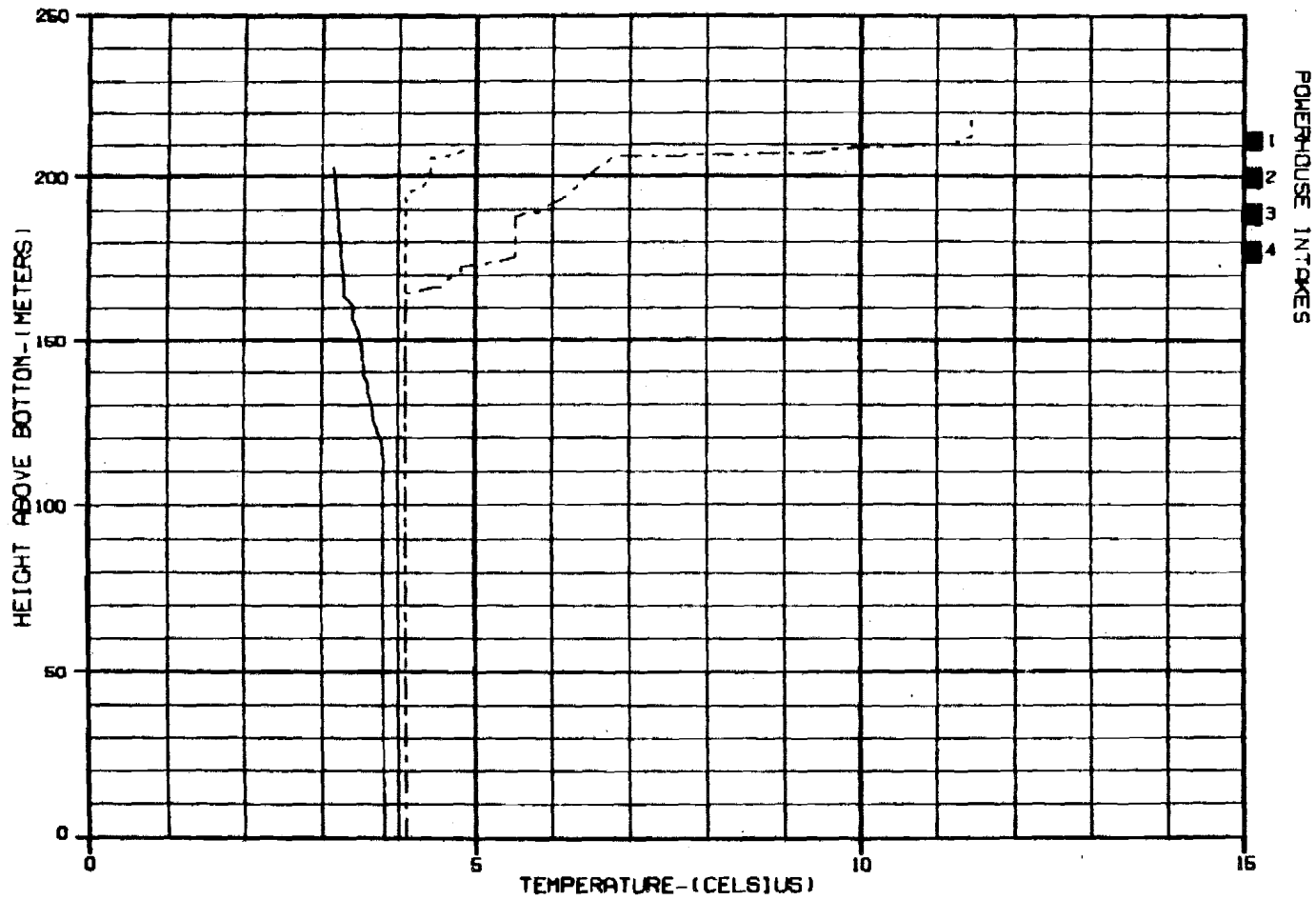
ALASKA POWER AUTHORITY

SUBSTRA PROJECT DYNEMA MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHECKED: ILLIENB 1 JAN 84 42-010-04



CASE: WAB1182102B - WATANA OPERATION WITH DEVIL CANYON IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- MAY 1982
- - - JUNE 1982
- · - · JULY 1982

ALASKA POWER AUTHORITY

SUBMITTA PROJECT DYNESH MODEL

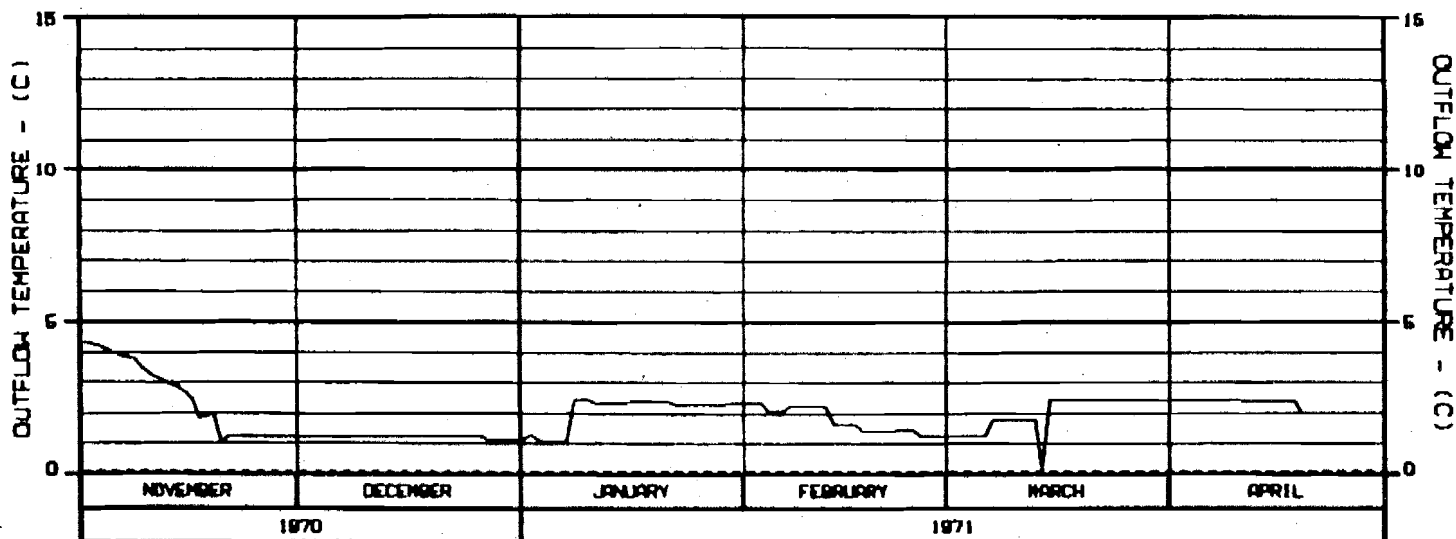
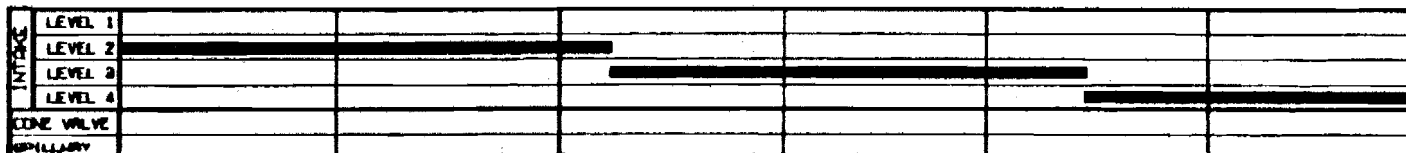
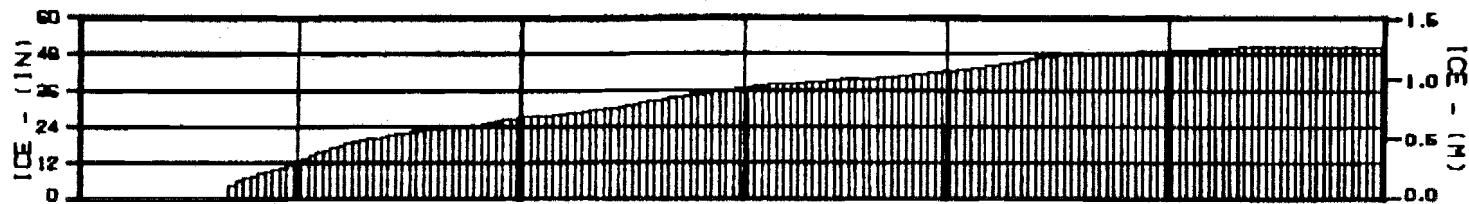
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHGCR - 24 IN 82 1 JAN 84 42-010-04

WATANA AND DEVIL CANYON OPERATING
2020 Energy Demands
Watana Reservoir Temperatures

EXHIBIT AE



LEGEND: CASE: 000 MA7120A - WATANA OPERATION WITH DEVIL CANYON IN 2020 000

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (655.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.0 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.0 M)
 6. SPILLWAY CREST AT ELEVATION 2140 FT (654.7 M)

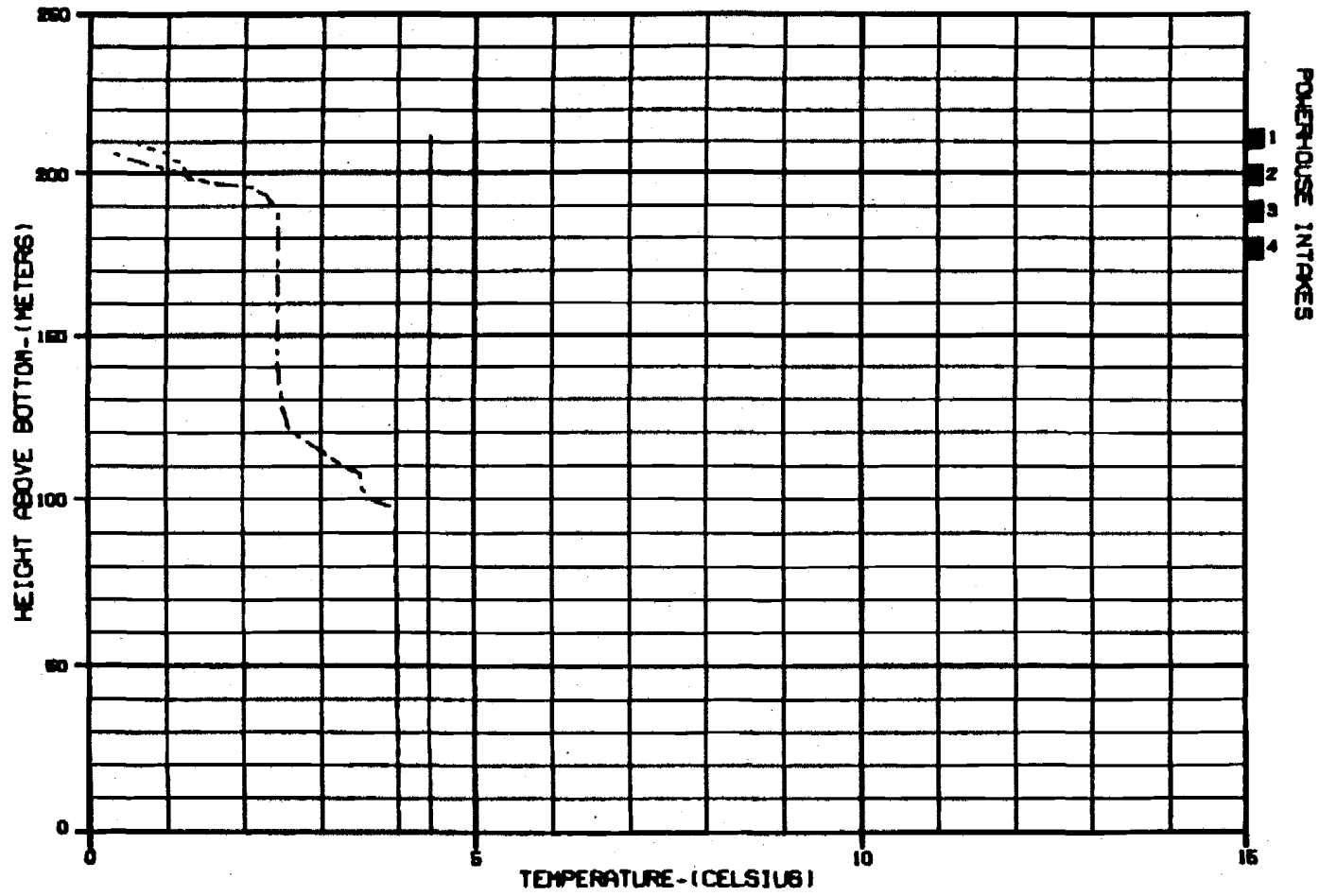
ALASKA POWER AUTHORITY

WATANA PROJECT DAMBORN MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DATE: 11-20-80 7 JAN 81 00-000-01



CASE: WA7120A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | NOVEMBER 1970
 | DECEMBER 1970
 - - - - | JANUARY 1971

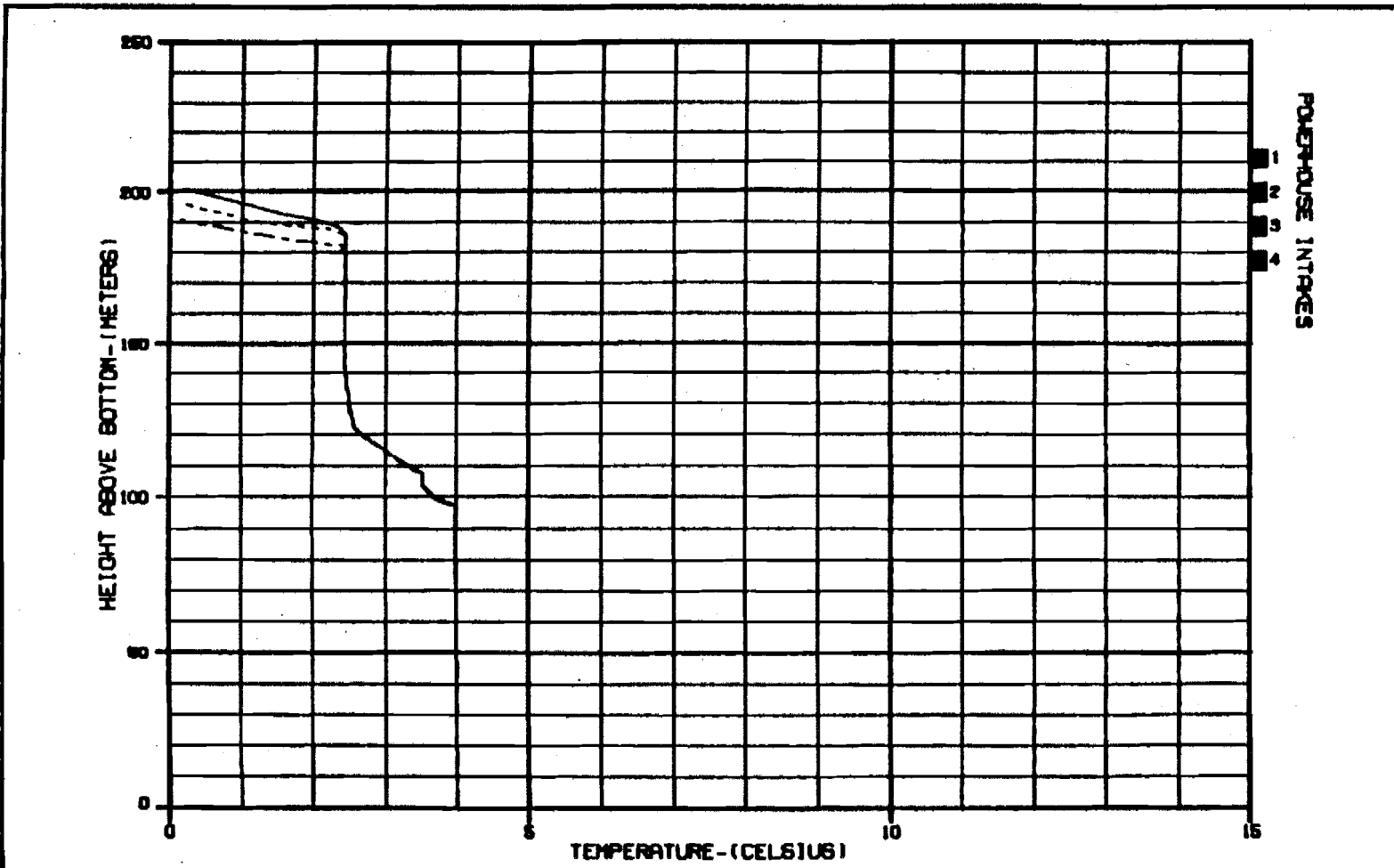
ALASKA POWER AUTHORITY

WATANA PROJECT | OPEN WHEEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

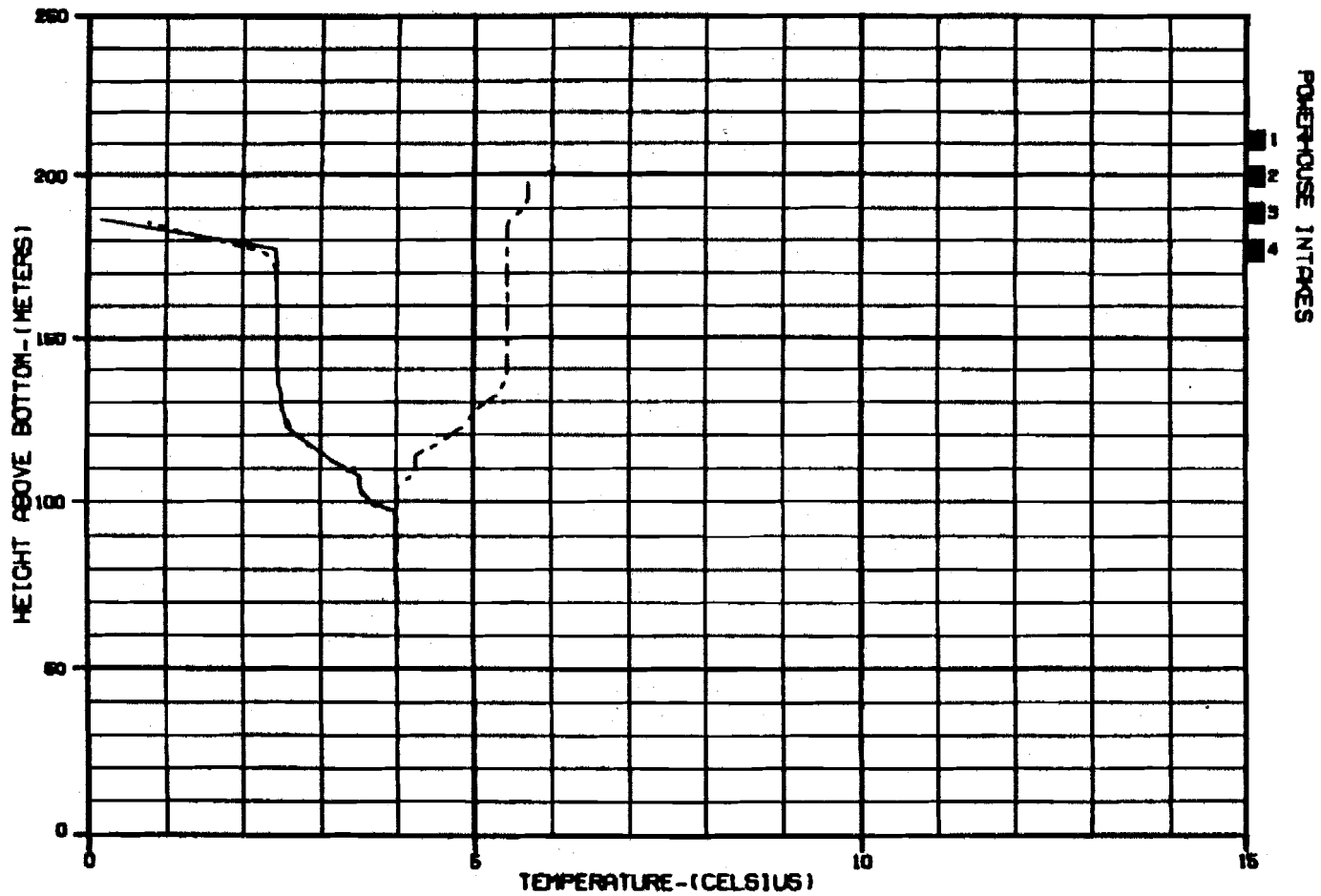
MODEL NUMBER 7.25 44 42-010-04



CASE: WA7120A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1971
 - - - - | MARCH 1971
 - · - · | APRIL 1971

ALASKA POWER AUTHORITY	
SUBJECT PROJECT	OVERSEA FIELD
WATANA RESERVOIR TEMPERATURE PROFILES	
MARZA-EBASCO JOINT VENTURE	
DESIGNED BY	42-010-04

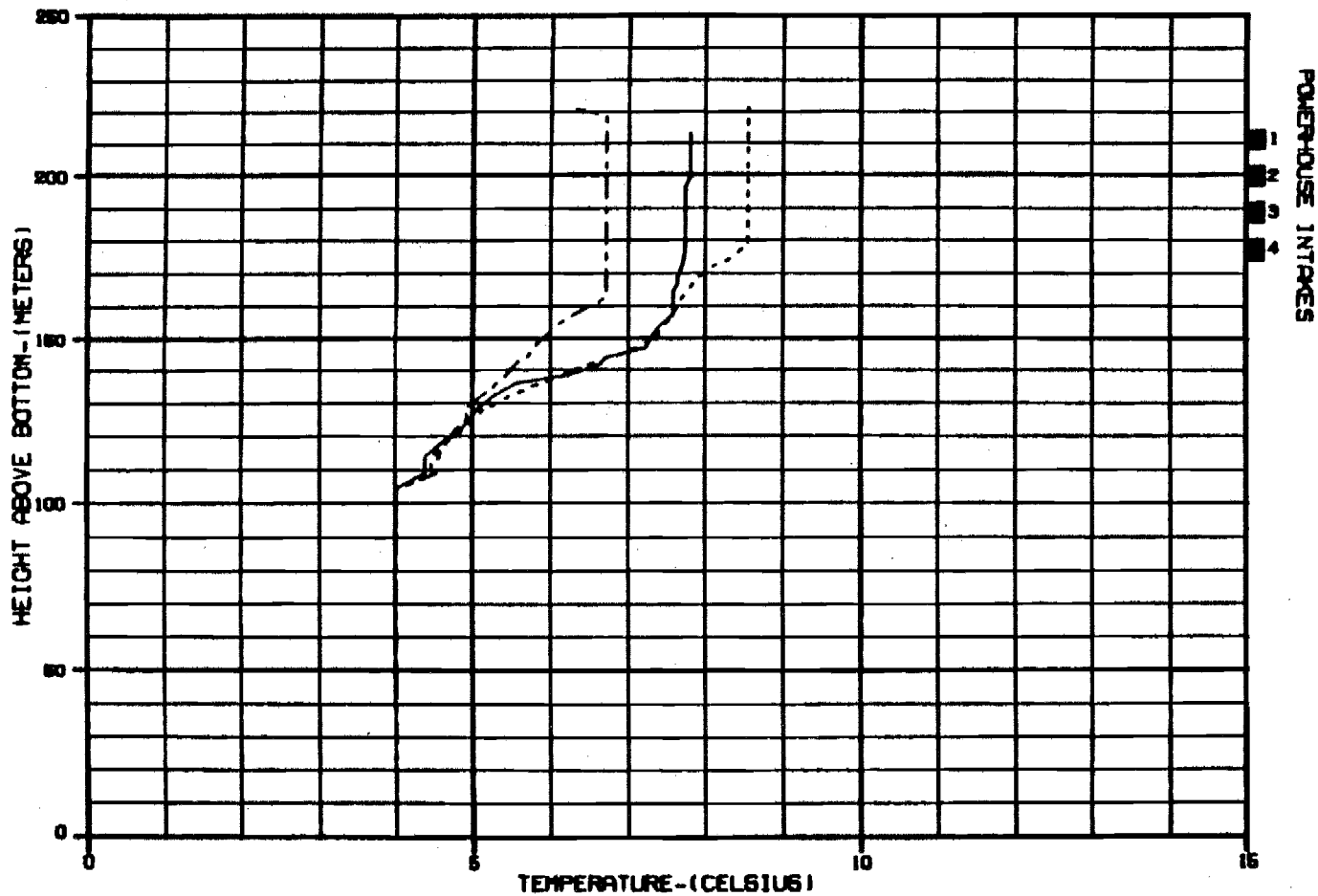


POWERHOUSE INTAKES

CASE: WA7120A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 MAY 1971
 - - - - - 1 JUNE 1971
 - · - · - 1 JULY 1971

ALASKA POWER AUTHORITY		
OWNER PROJECT	OWNER NAME	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DESIGNED BY	DATE	REV
ALD	7 JAN 81	42-010-04



CASE: ■■ WA7120A - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | AUGUST 1971
- | SEPTEMBER 1971
- - - - - | OCTOBER 1971

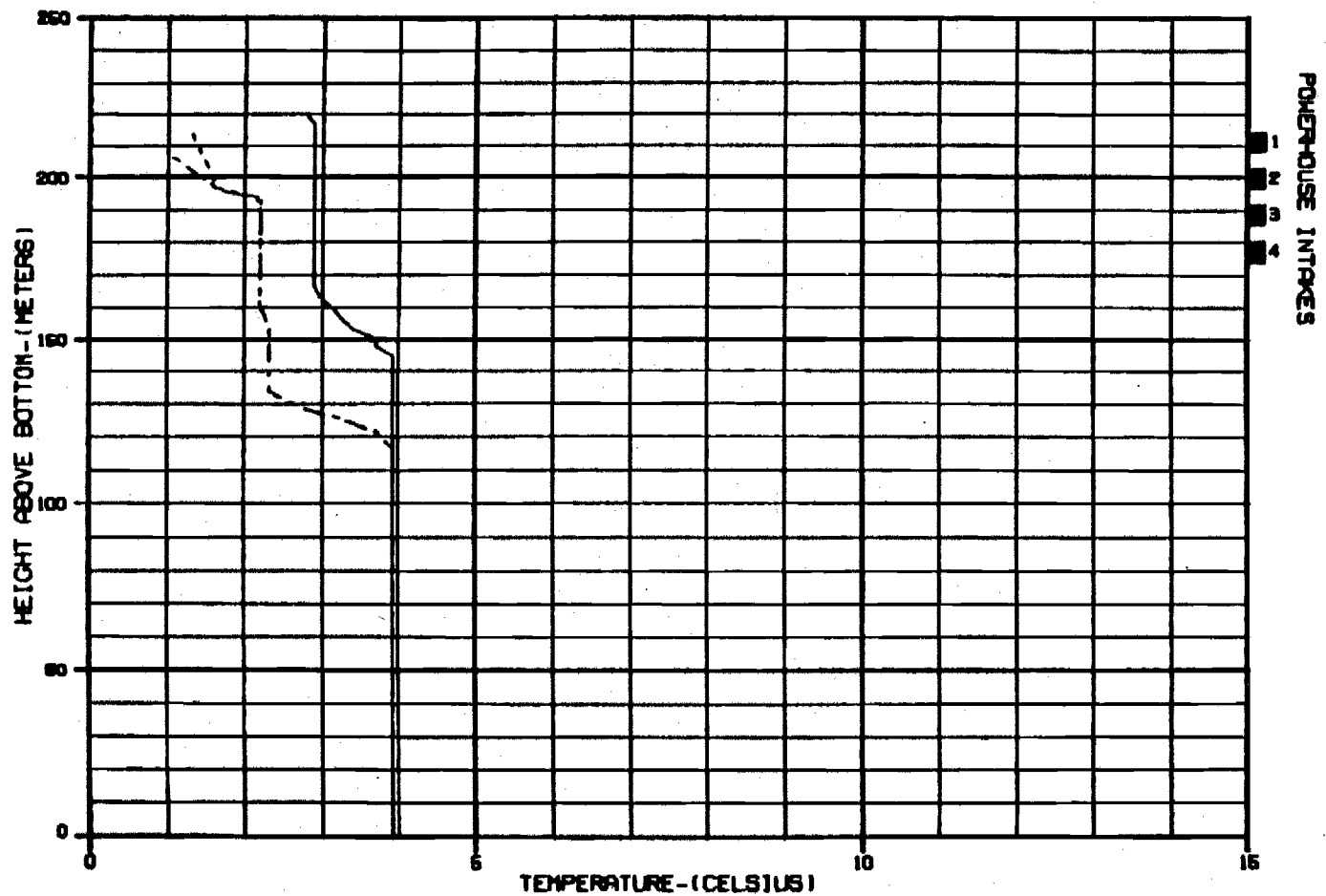
ALASKA POWER AUTHORITY

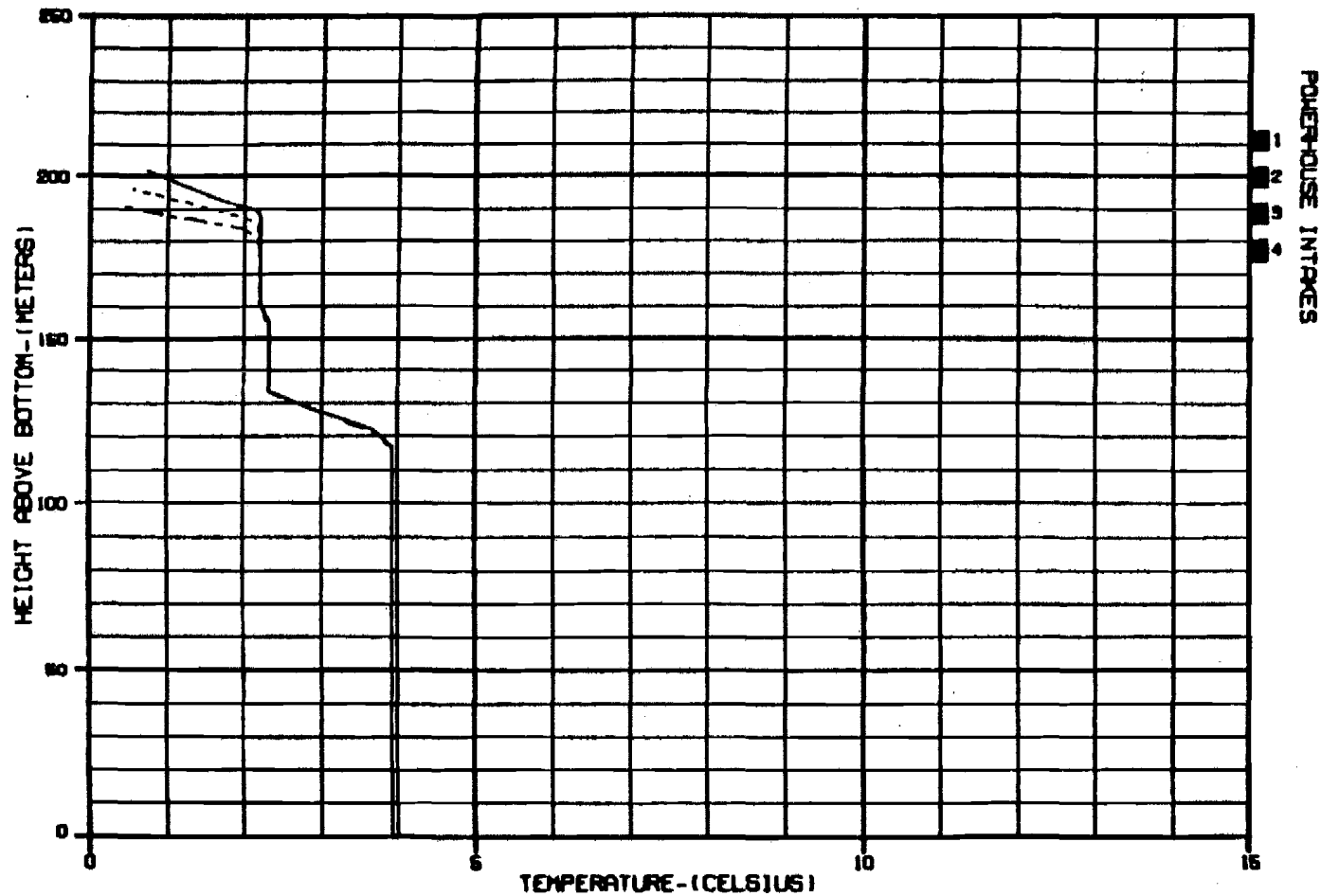
SUBMITTA PROJECT | DESIGN MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGN - 04/000 7.25 00 4E-000-04





CASE: WA7120A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— FEBRUARY 1972
 - - - MARCH 1972
 - · - · APRIL 1972

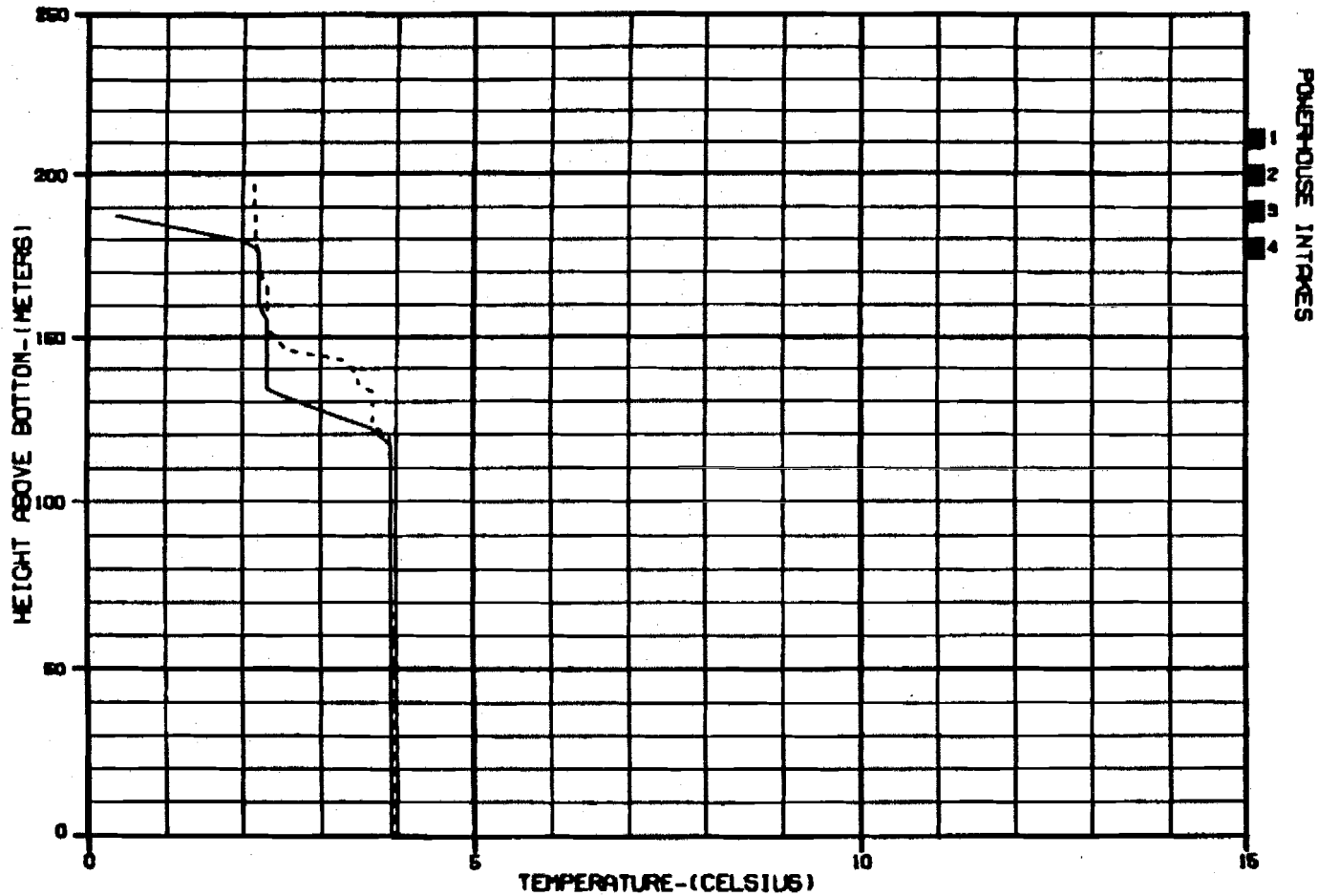
ALASKA POWER AUTHORITY

SUBMITTA PROJECT OPENING MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HRZA-EBASCO JOINT VENTURE

DESIGN: B.L.B. 7 JAN 81 42-016-04



CASE: WA7120A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- MAY 1972
- JUNE 1972
- JULY 1972

ALASKA POWER AUTHORITY

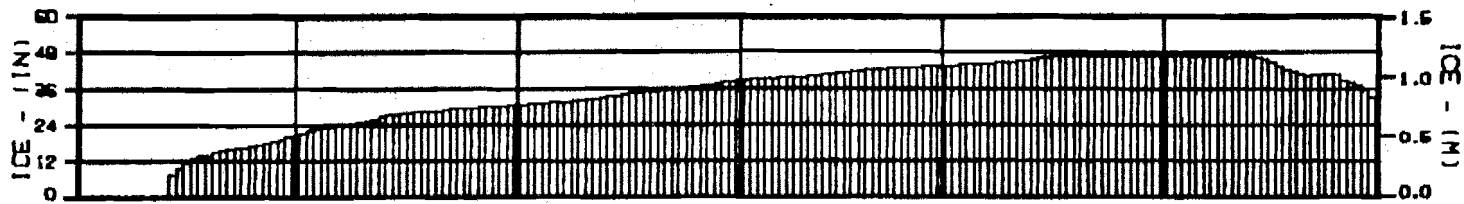
WATANA PROJECT DIVISION HEAD

WATANA RESERVOIR
TEMPERATURE PROFILES

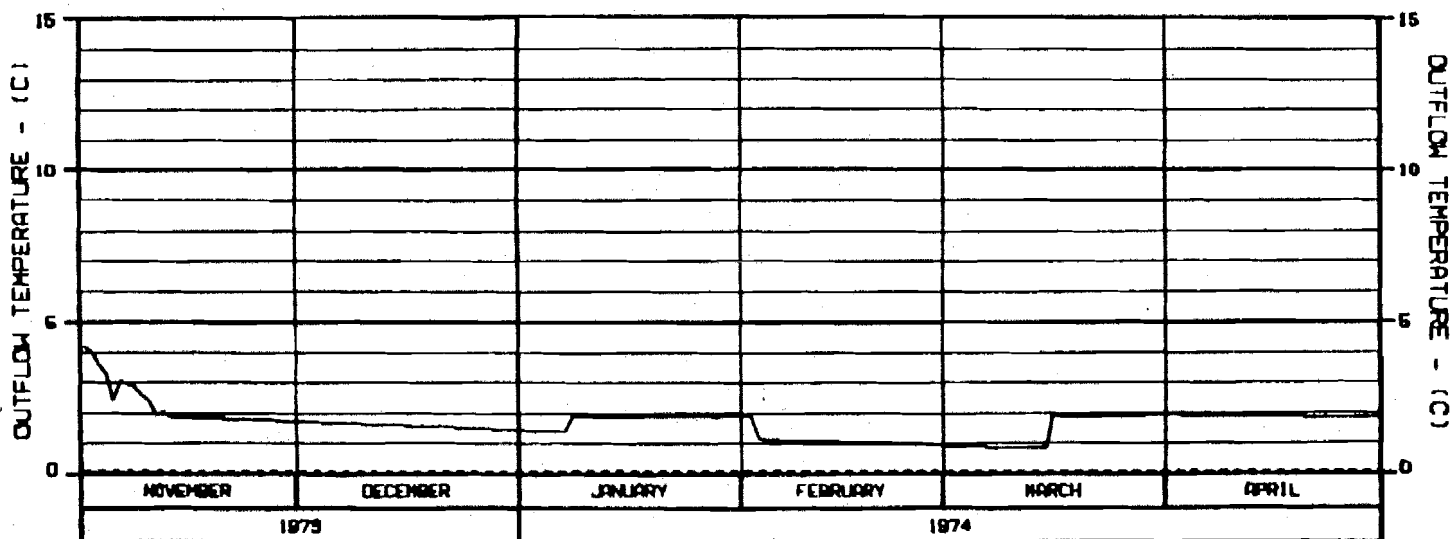
WARZA-EMRACO JOINT VENTURE

WORKING DRAWING 7 JAN 81 42-010-04

EXHIBIT AF



INTAKE	LEVEL 1				
	LEVEL 2				
	LEVEL 3				
	LEVEL 4				
	CONE VALVE				
	SPILLWAY				



LEGEND: CASE: ■■ WA7420A - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

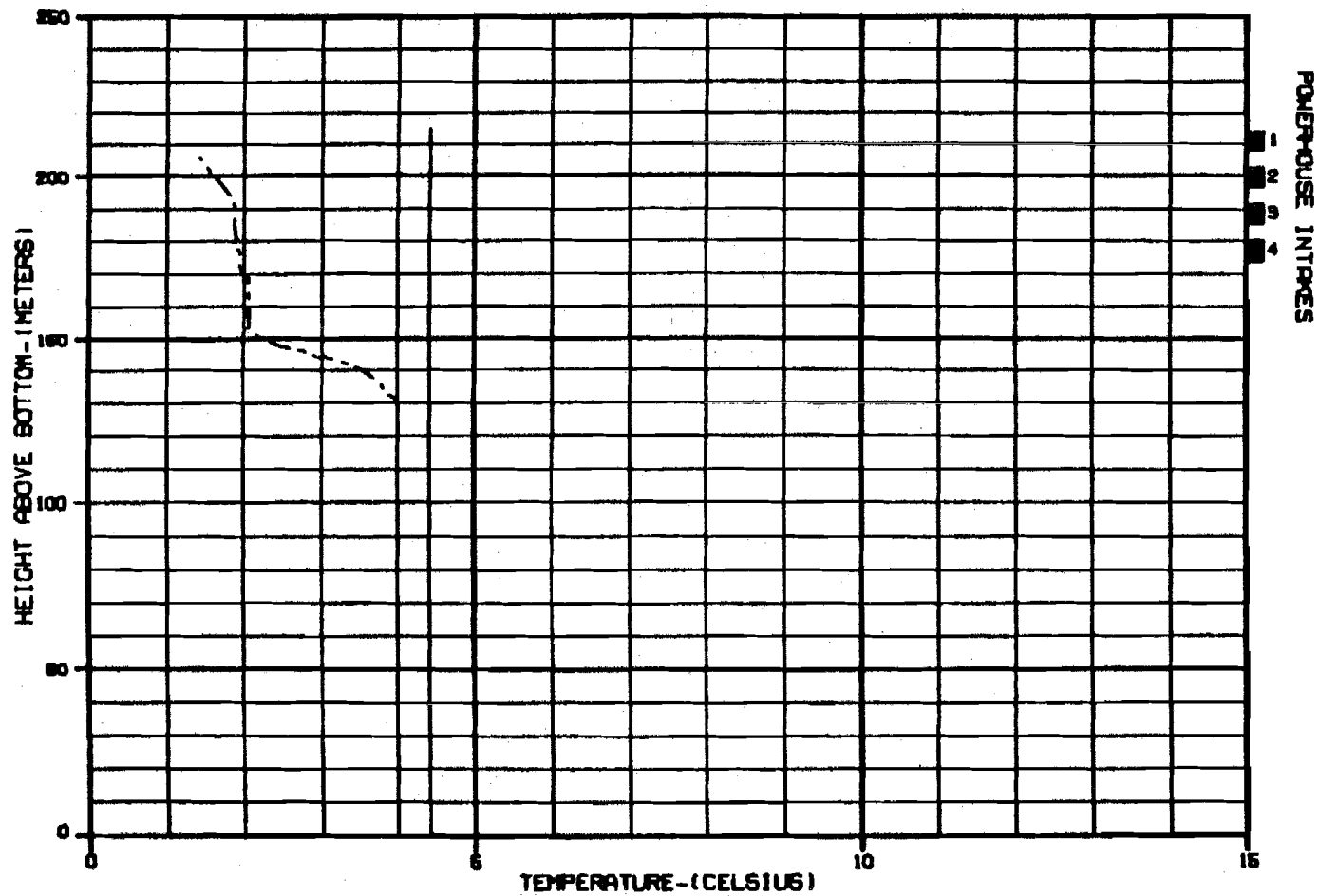
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DESIGN MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HRZA-EBASCO JOINT VENTURE

DESIGN: EL-1408 7 JAN 84 48-048-04



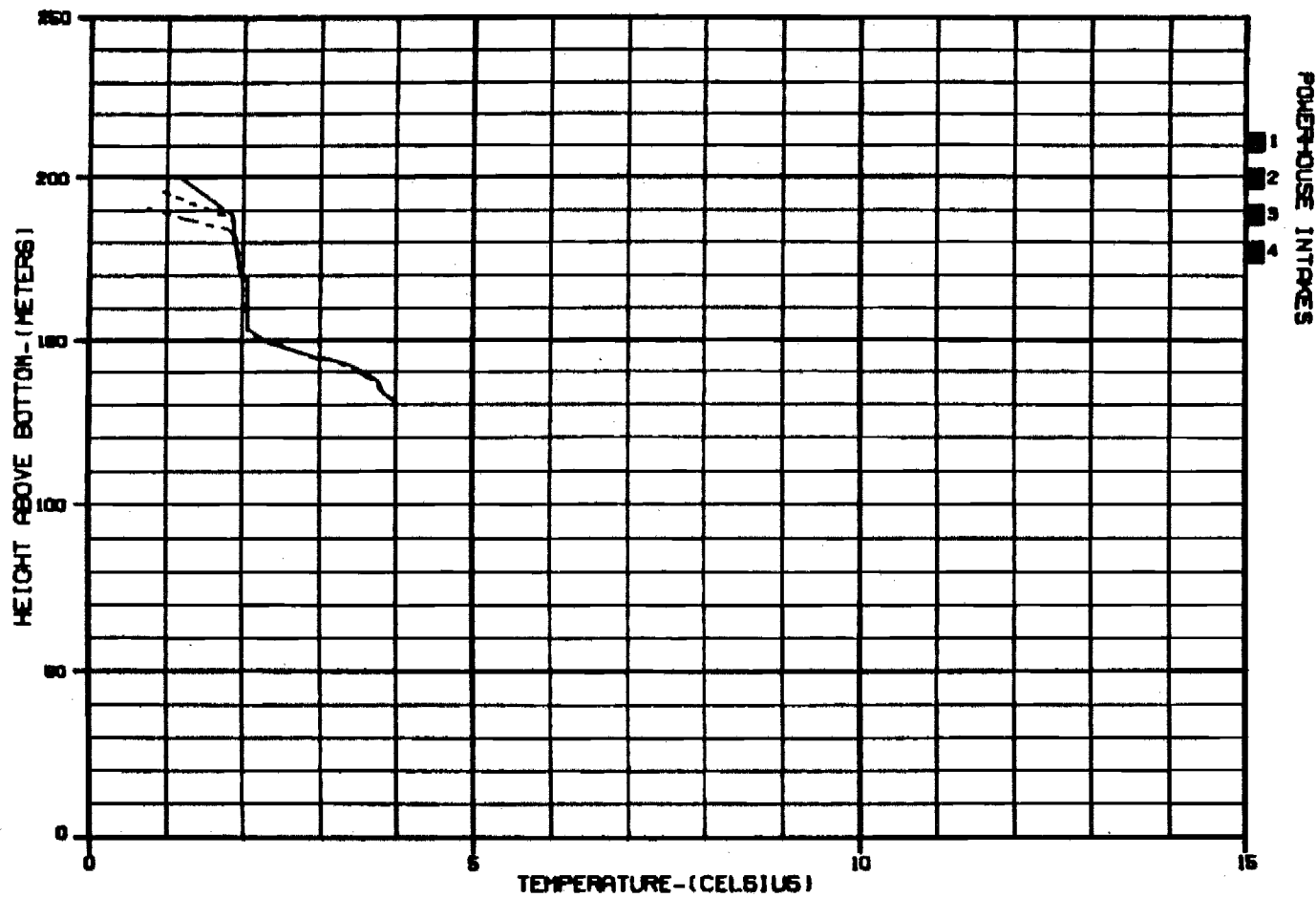
CASE: WA7420A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | NOVEMBER 1973
- | DECEMBER 1973
- - - - - | JANUARY 1974

ALASKA POWER AUTHORITY		
BASELINE PROJECT	ENVIRONMENTAL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DATE: 11/19/83	7 JAN 84	42-010-04



CASE: ■■ WA7420A - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 FEBRUARY 1974
- 1 MARCH 1974
- 1 APRIL 1974

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OFFSHORE RESER.

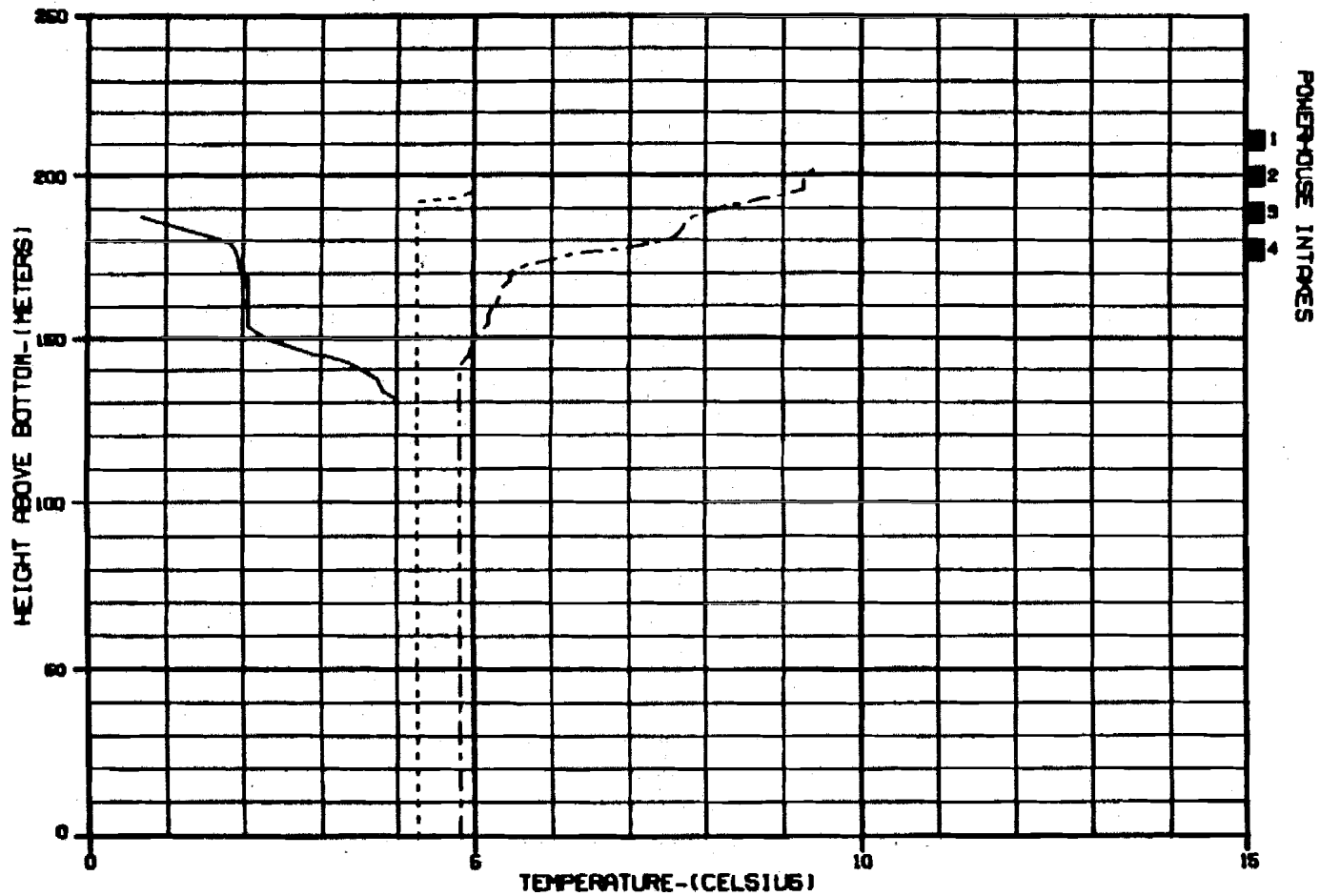
WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBRACO JOINT VENTURE

ORDER: 84-000

7 JAN 85

42-010-04



CASE: WA7420A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— MAY 1974
 - - - JUNE 1974
 - · - · JULY 1974

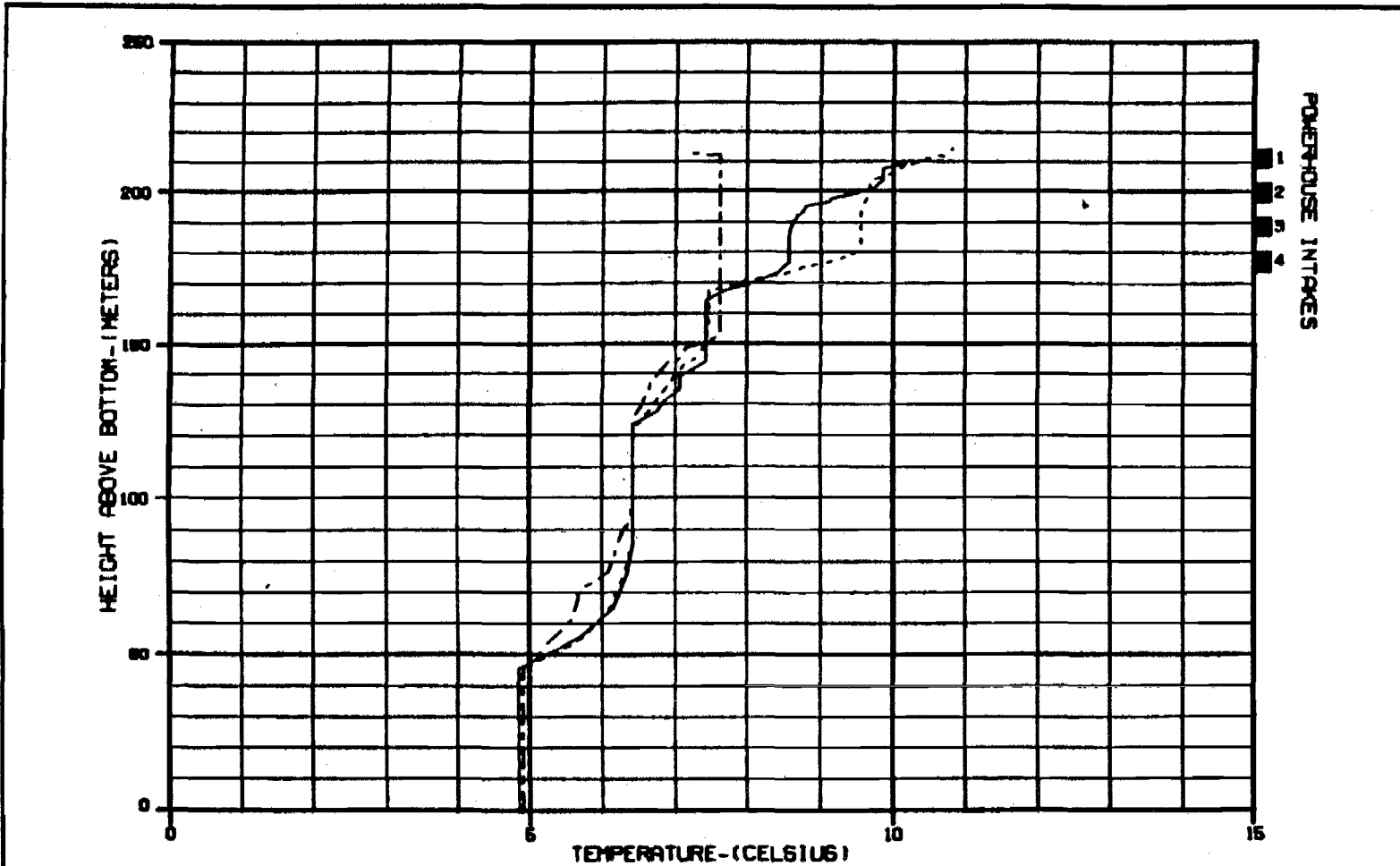
ALASKA POWER AUTHORITY

WATANA PROJECT DIVISION HEAD

WATANA RESERVOIR
 TEMPERATURE PROFILES

WARSA-ERBECO JOINT VENTURE

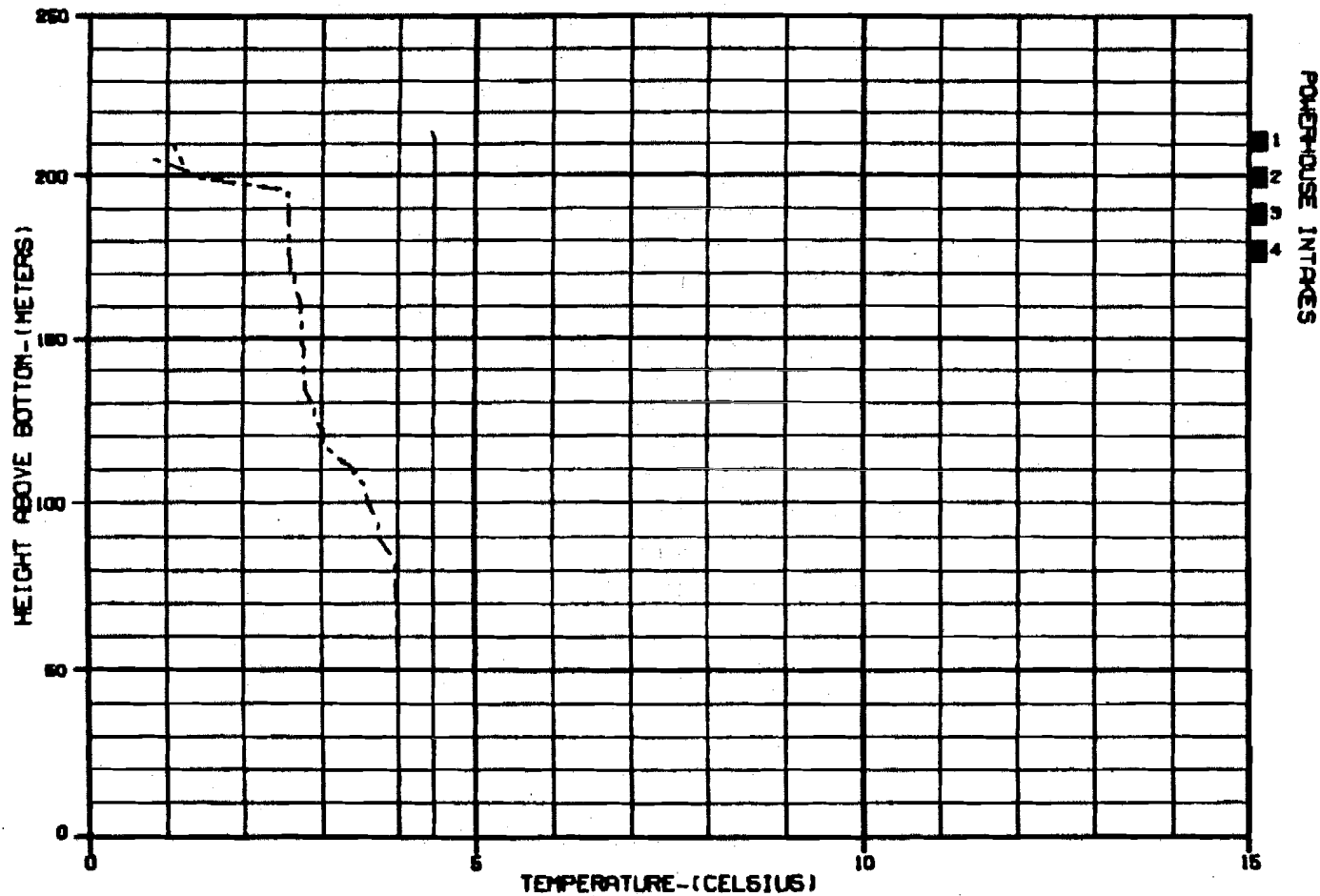
GRAPHIC SCALE 1 JAN 84 42-010-04



CASE: WA7420A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 _____ | AUGUST 1974
 - - - - - | SEPTEMBER 1974
 - - - - - | OCTOBER 1974

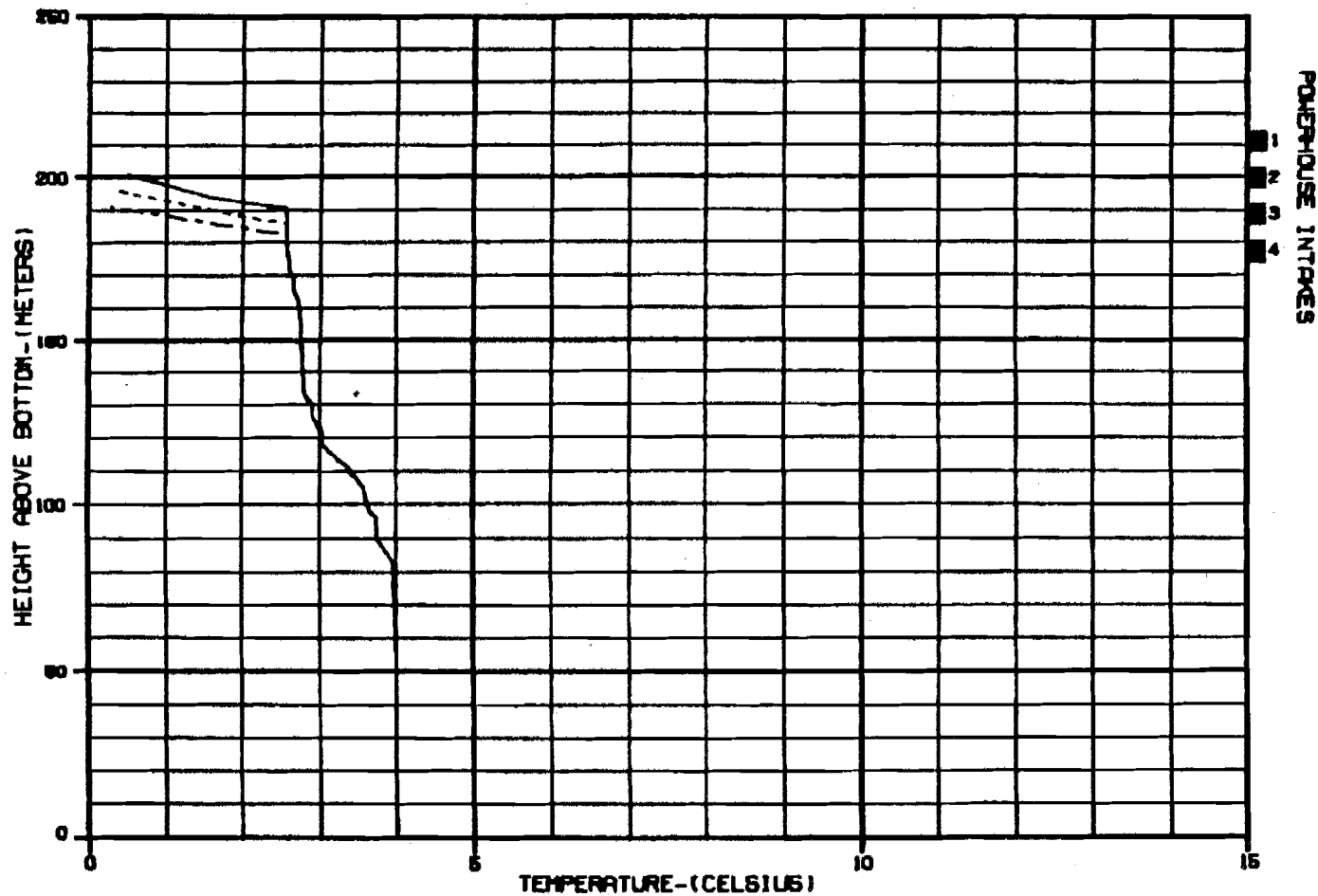
ALASKA POWER AUTHORITY	
OWNER PROJECT	DESIGN NO.
WATANA RESERVOIR TEMPERATURE PROFILES	
HAZRA-EBASCO JOINT VENTURE	
DATE: 11/20/74	42-010-04



CASE: WA7420A - MATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1974
 - - - - - | DECEMBER 1974
 - · - · - | JANUARY 1975

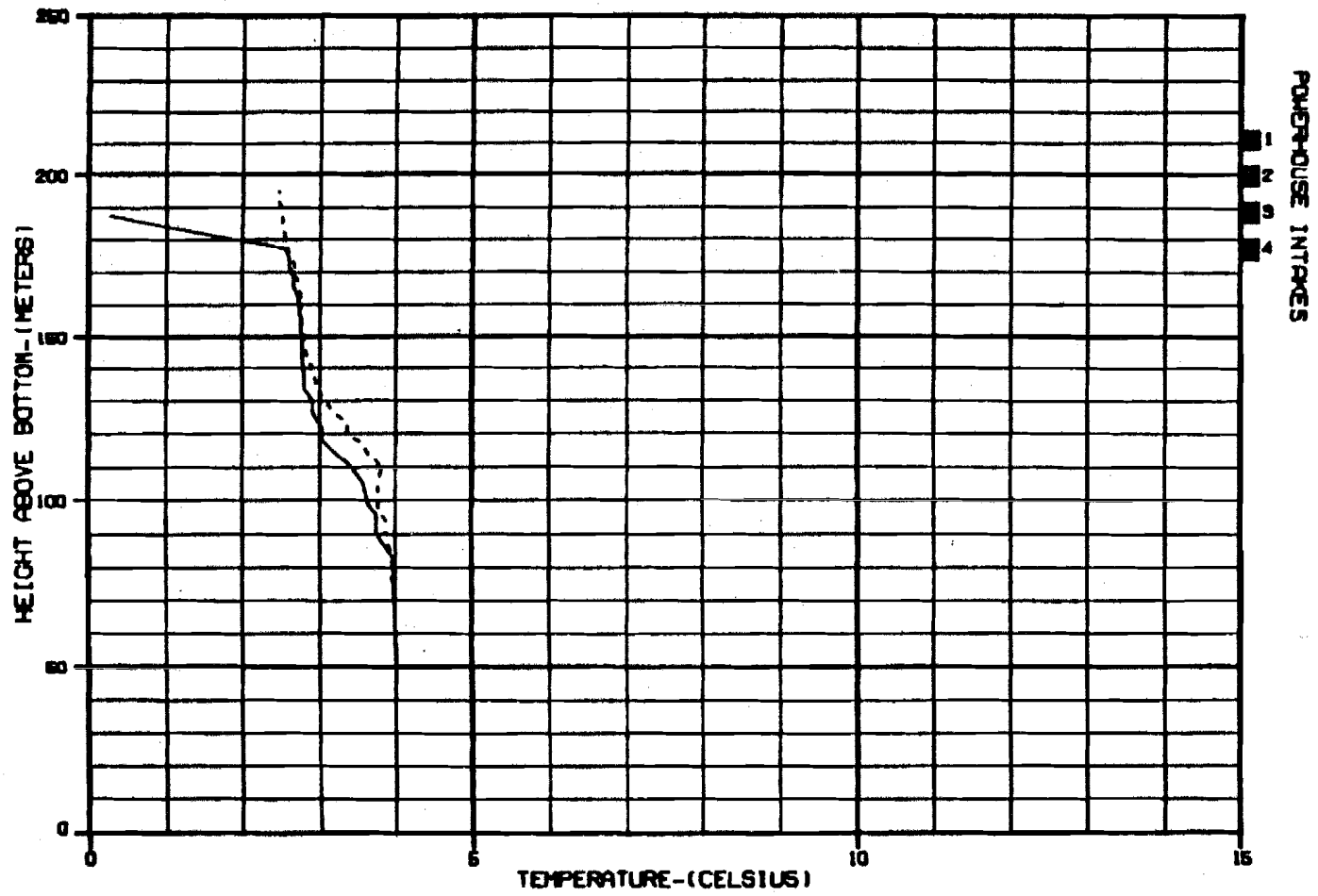
ALASKA POWER AUTHORITY		
DESIGN PROJECT	CIVIL ENGINEERING	
MATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DESIGN NUMBER	7-21-74	42-010-04



CASE: WA7420A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— 1 FEBRUARY 1975
 1 MARCH 1975
 - - - - 1 APRIL 1975

ALASKA POWER AUTHORITY	
OWNER PROJECT	DRAWN FILED
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
DESIGN: ALP/RS	4-210-04



POWEROUSE INTAKES
1
2
3
4

CASE: ■■ W97420A - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

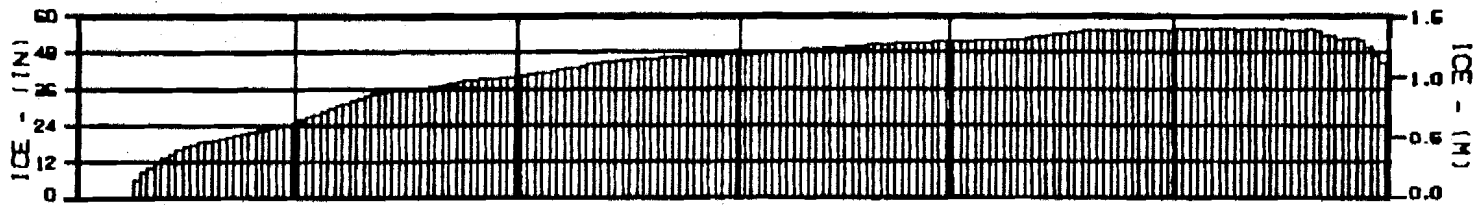
LEGEND:

PREDICTED TEMPERATURE PROFILES:

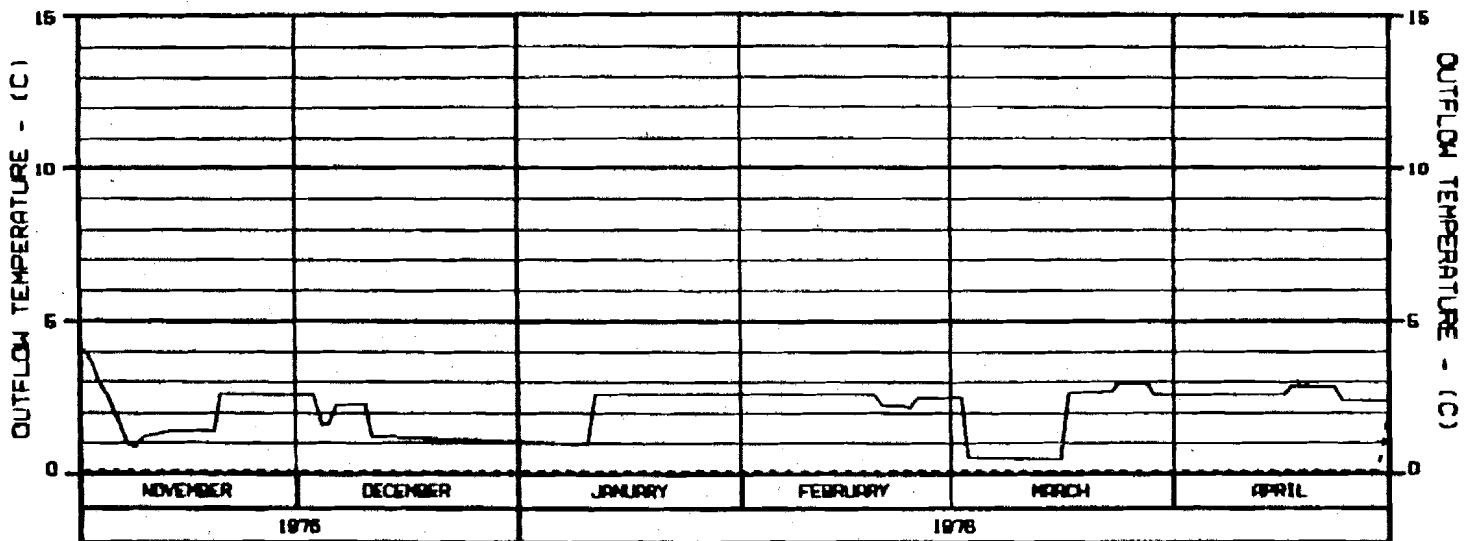
- | MAY 1975
- | JUNE 1975
- - - - - | JULY 1975

ALASKA POWER AUTHORITY	
EXISTING PROJECT	NEWER MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
WARSA-EBERD JOINT VENTURE	
DATE: 8/28/80	7 AM '81
42-010-04	

EXHIBIT AG



INTAKE	LEVEL 1	██████████				
	LEVEL 2	██████████	██████████			
	LEVEL 3		██████████	██████████		
	LEVEL 4				██████████	██████████
	CONE VALVE					
	SPILLWAY					



LEGEND: CASE: 444 WA7620A - WATANA OPERATION WITH DEVIL CANYON IN 2020 444

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.0 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.0 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

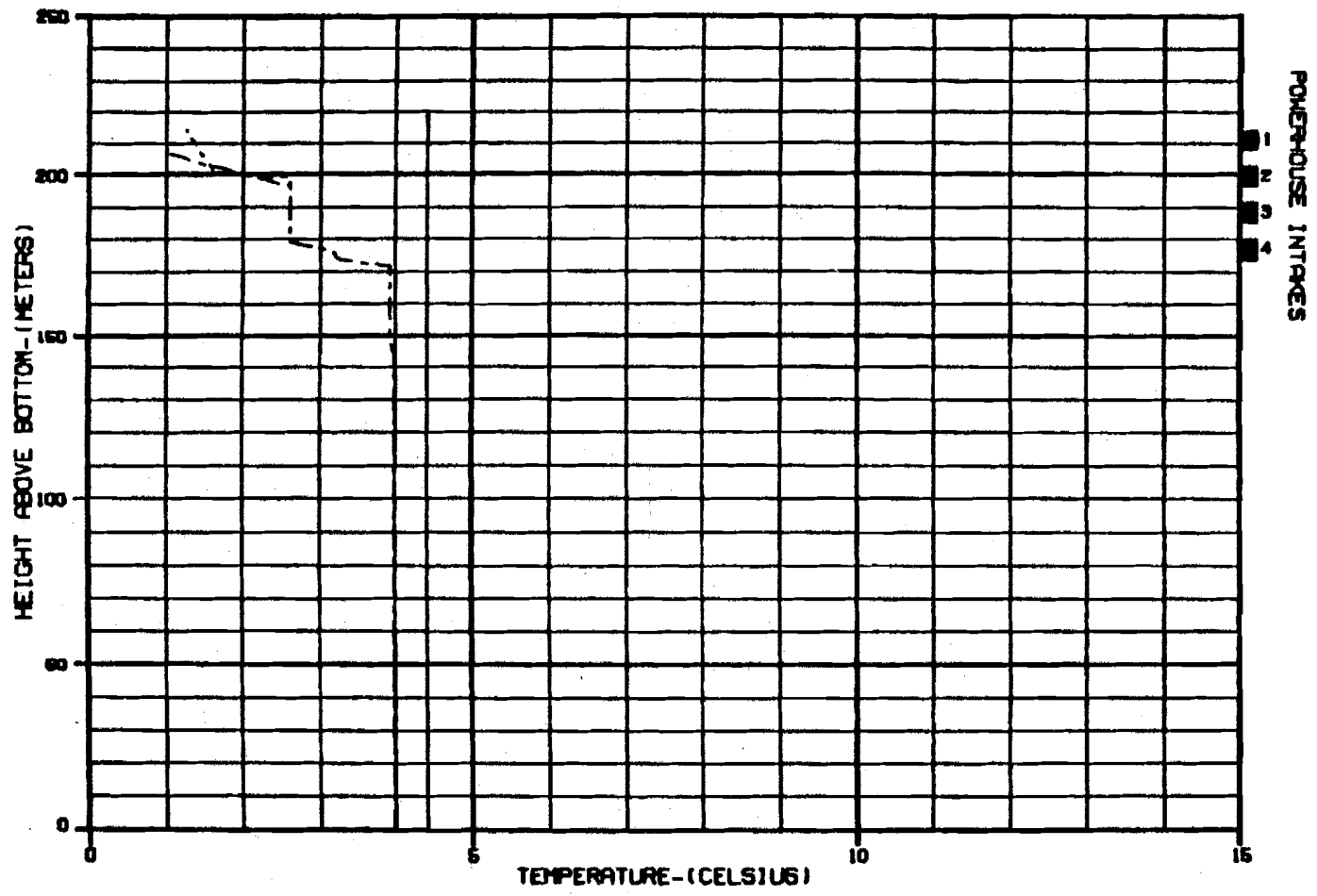
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DIVISION MODEL

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

WARZA-EBRSCO JOINT VENTURE

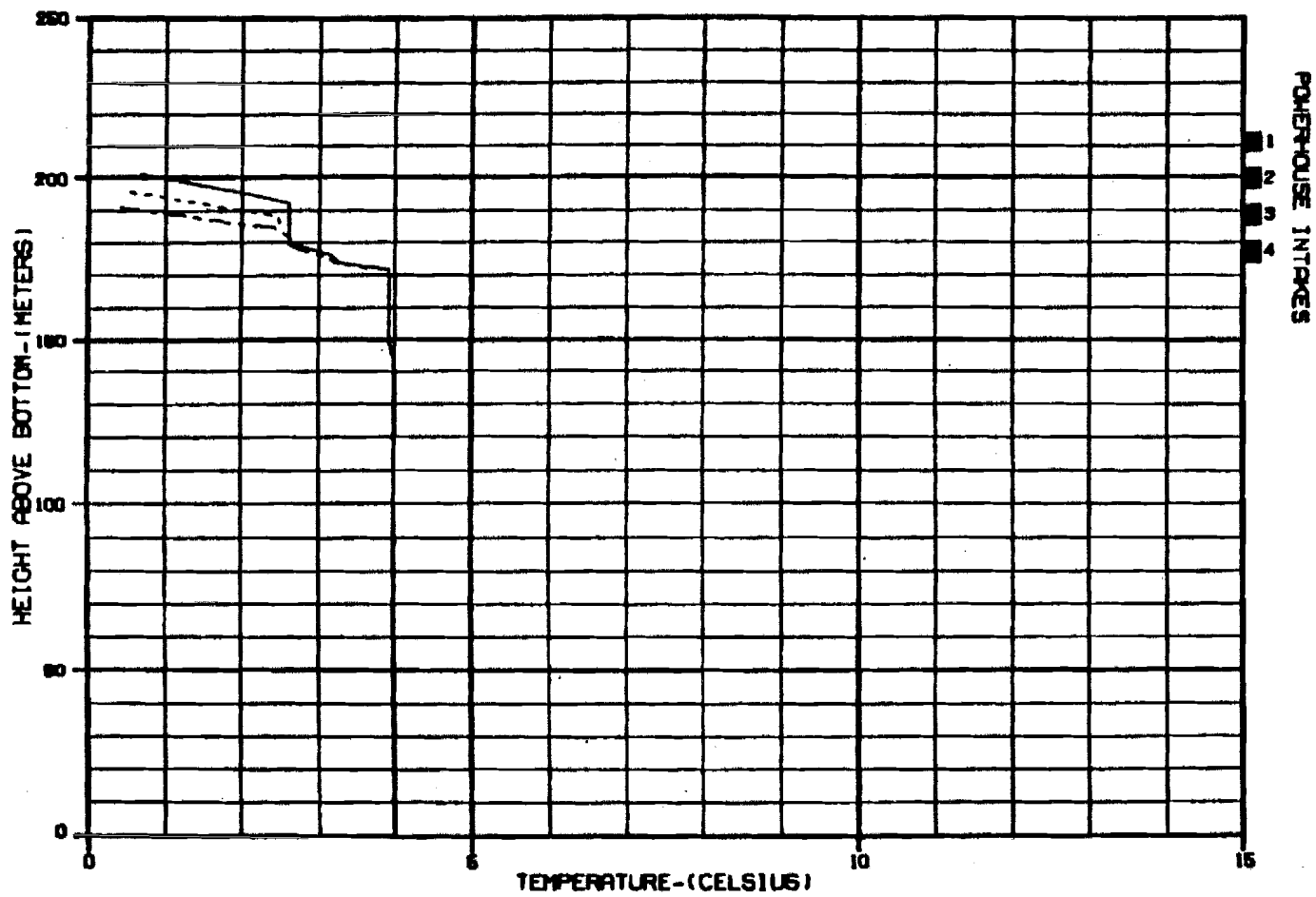
DESIGN: B.L. BROWN 7 JAN 84 48-008-04



CASE: WY7620A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— 1 NOVEMBER 1975
 - - - - 1 DECEMBER 1975
 - · - · 1 JANUARY 1976

ALASKA POWER AUTHORITY	
SLITVA PROJECT	ORDER NO.
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
DESIGN DRAWING	DATE 4-21-04



CASE: # WA7620A - WATANA OPERATION WITH DEVIL CANYON IN 2020 #

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | FEBRUARY 1976
 | MARCH 1976
 - - - - - | APRIL 1976

ALASKA POWER AUTHORITY

WATANA PROJECT

GREEN HERRL

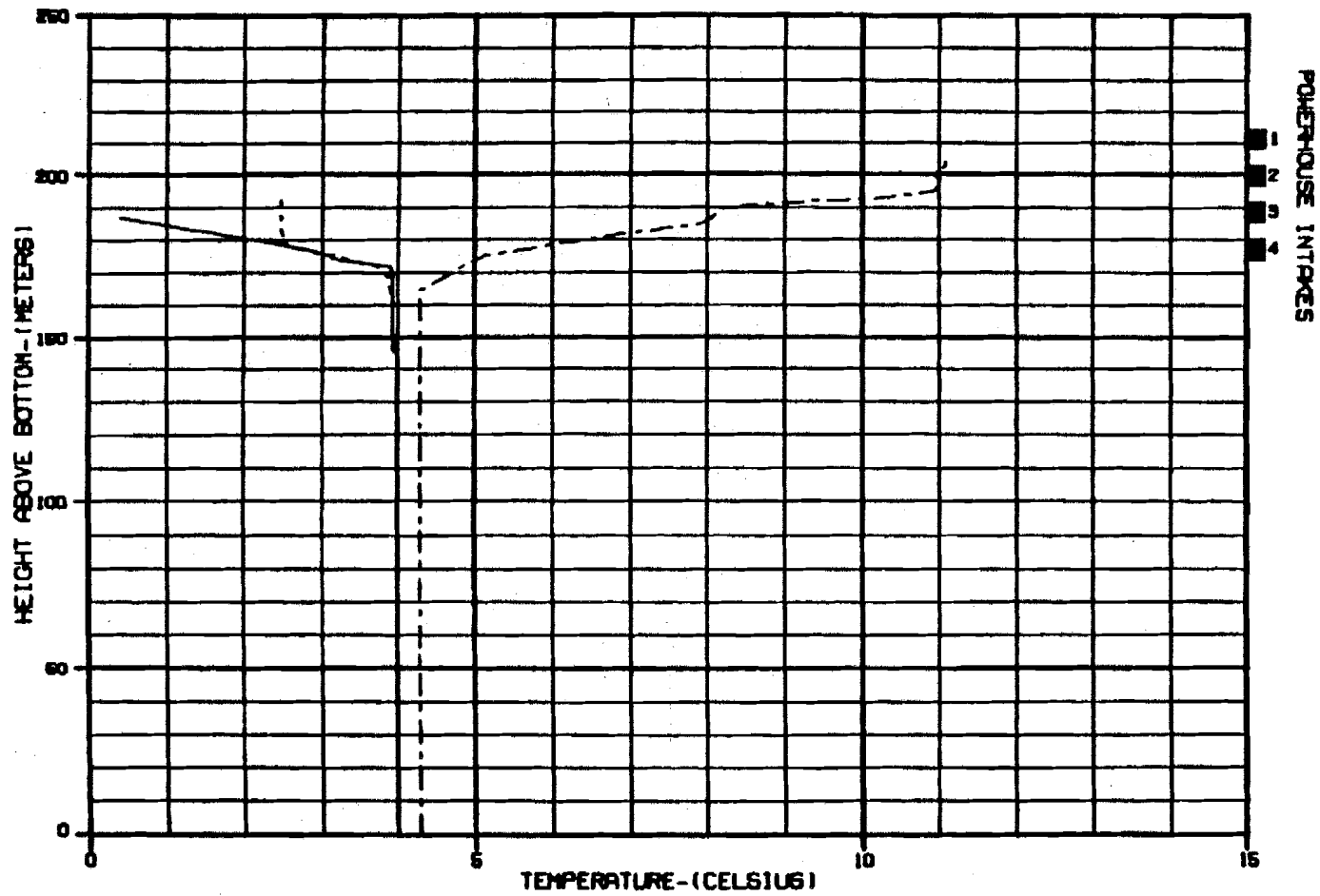
WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EDBECO JOINT VENTURE

DESIGNED BY: BLD/00

7 JAN 81

42-010-04



CASE: WA7620A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— MAY 1978
 JUNE 1978
 - - - - - JULY 1978

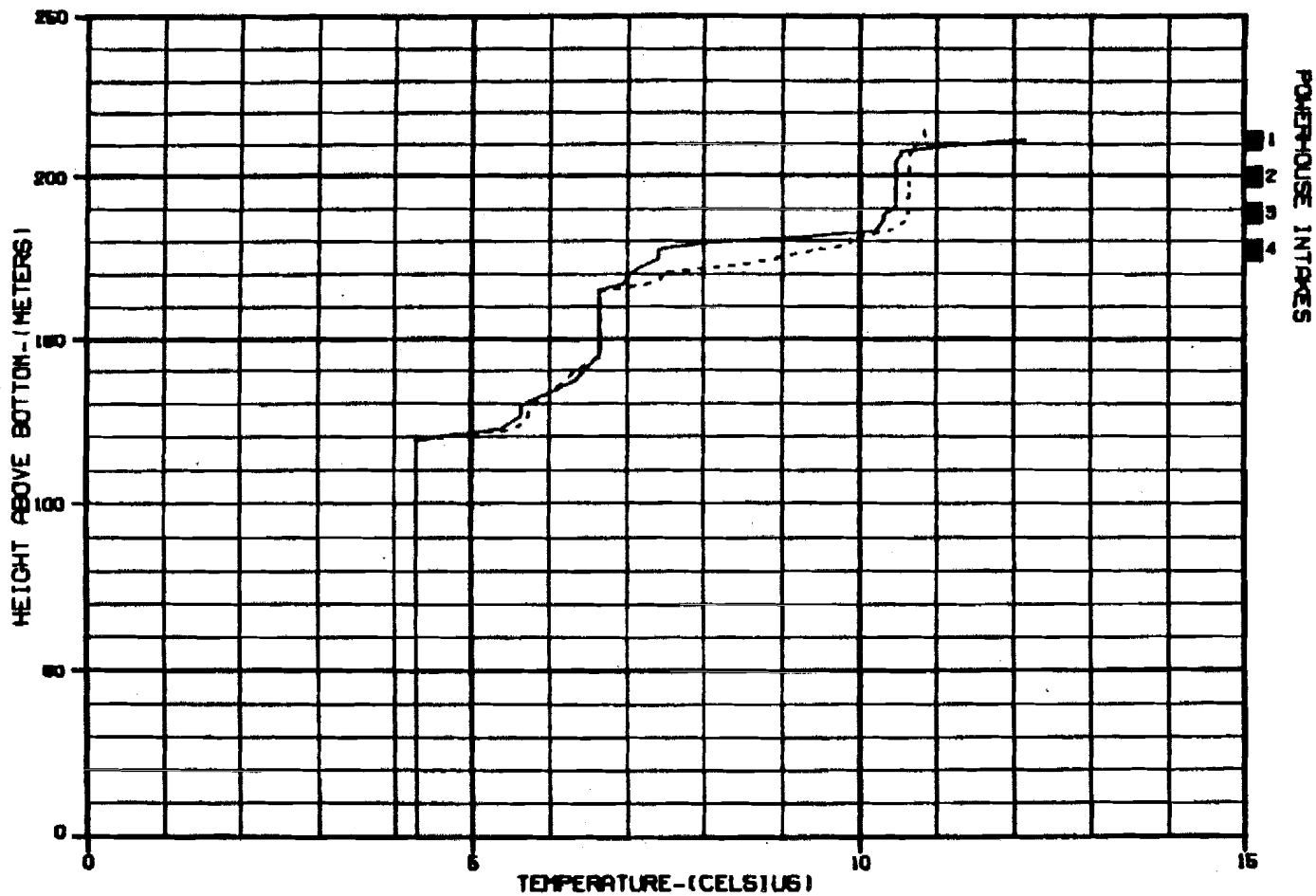
ALASKA POWER AUTHORITY

WATANA PROJECT DIVISION HEAD

WATANA RESERVOIR
 TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

DESIGN: B.L.D. 7 JAN 84 4-010-04



CASE: ■■ WA7820A - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— | AUGUST 1978
 - - - - | SEPTEMBER 1978
 - · - · - | OCTOBER 1978

ALASKA POWER AUTHORITY

SUBMITTER PROJECT

DESIGN NUMBER

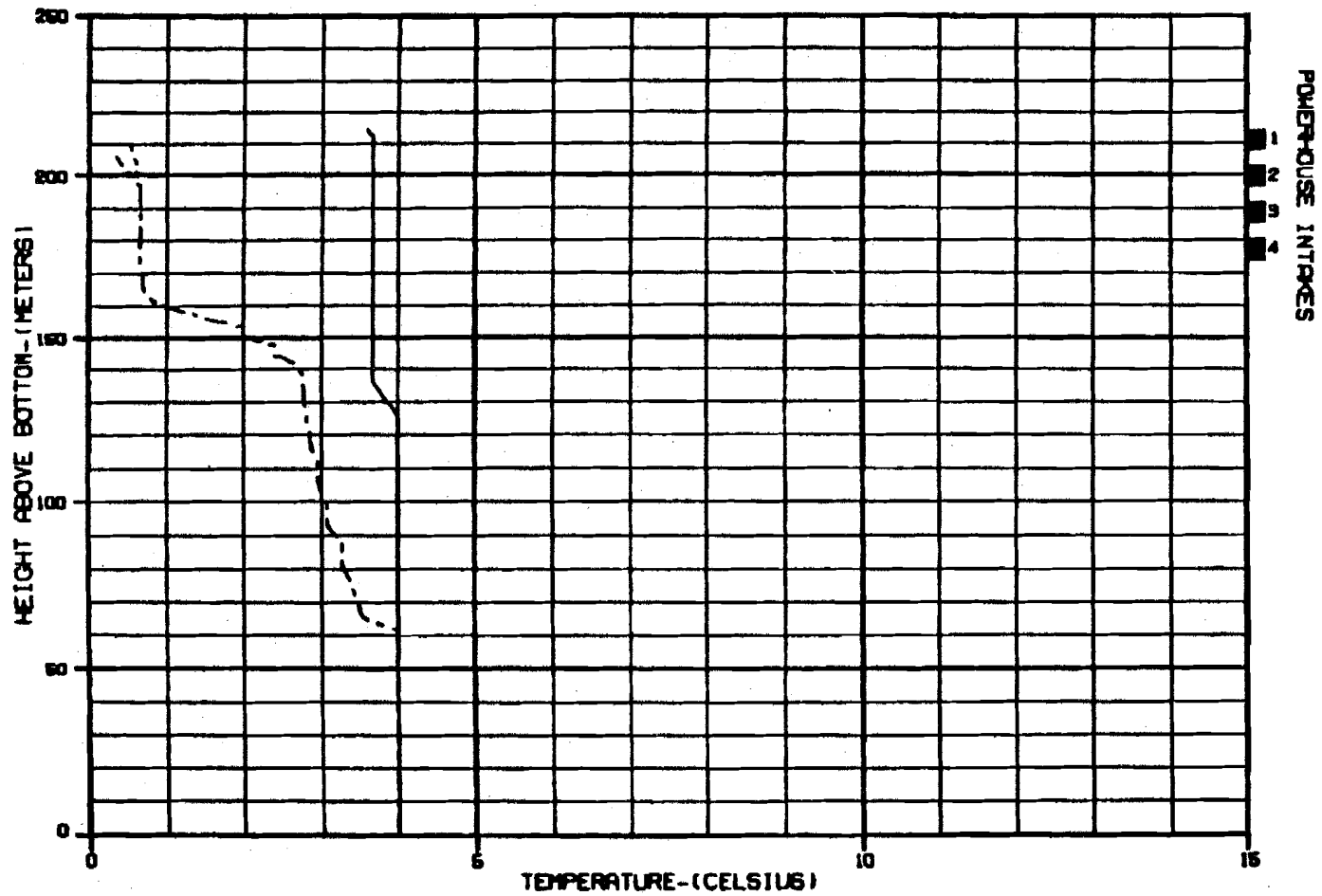
WATANA RESERVOIR
TEMPERATURE PROFILES

WARSA-EBASCO JOINT VENTURE

DATE: 01/08/81

7 JAN 81

42-010-04



CASE: ■■ WA7820A - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 NOVEMBER 1976
 - - - 1 DECEMBER 1976
 - · - · 1 JANUARY 1977

ALASKA POWER AUTHORITY

QUESTOR PROJECT

OWNER MODEL

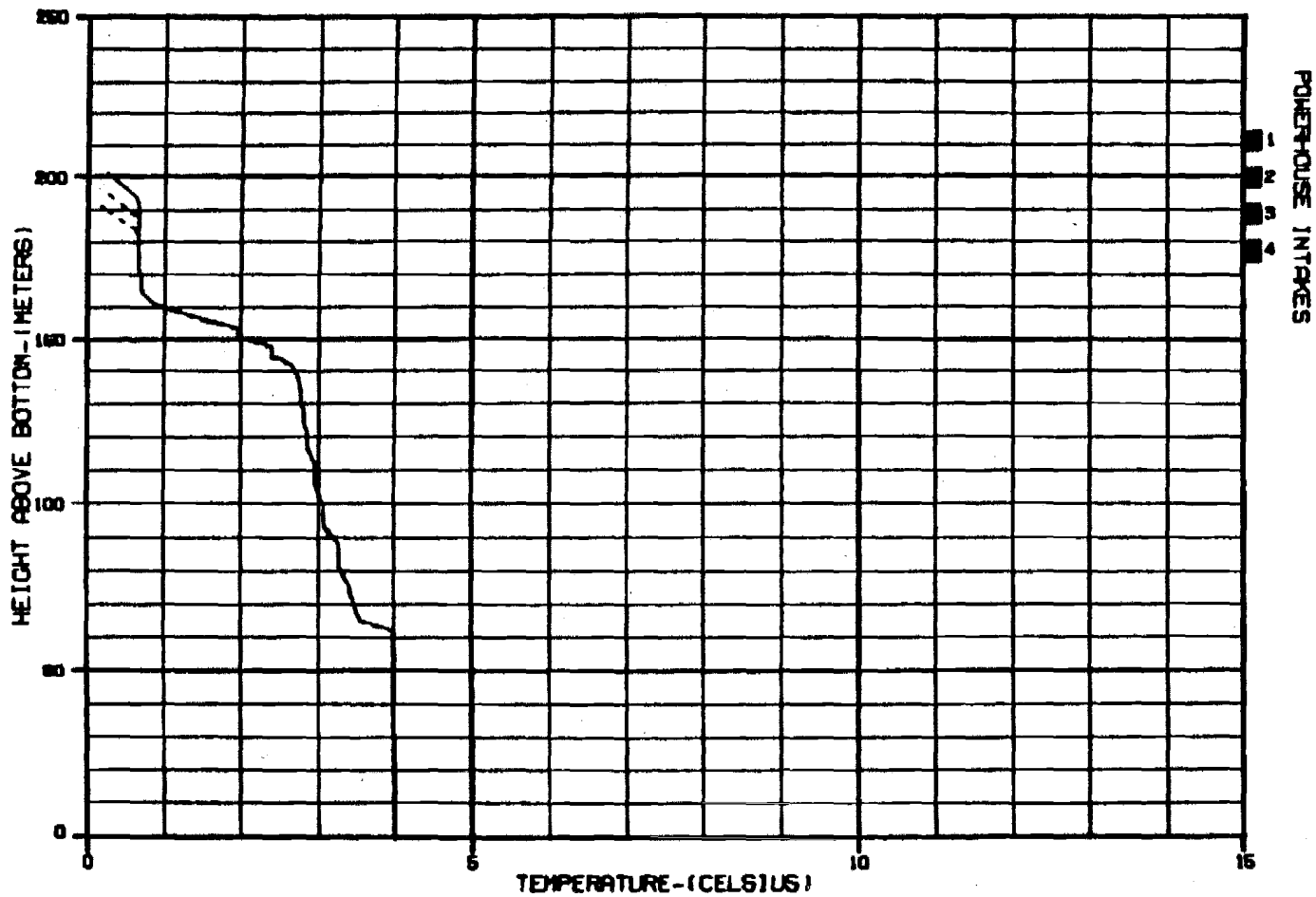
WATANA RESERVOIR
 TEMPERATURE PROFILES

HAZRA-EBASCO JOINT VENTURE

DESIGN - E.L.P. 1977

7 JAN 81

42-010-04



CASE: WA7820A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- FEBRUARY 1977
- - - MARCH 1977
- · - · - APRIL 1977

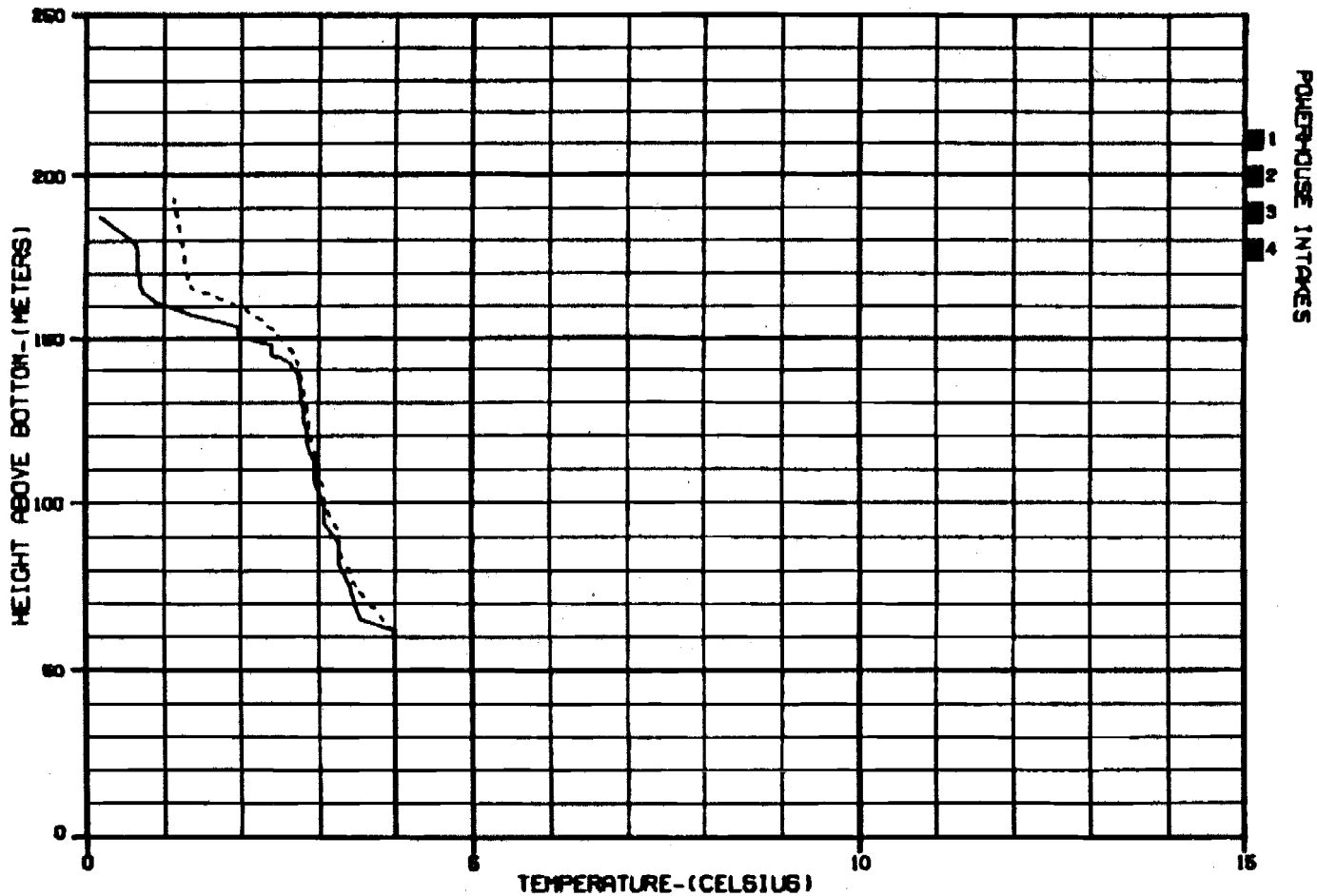
ALASKA POWER AUTHORITY

WATANA PROJECT GREEN RIVER

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

WATER 819000 7 JAN 84 4-810-04



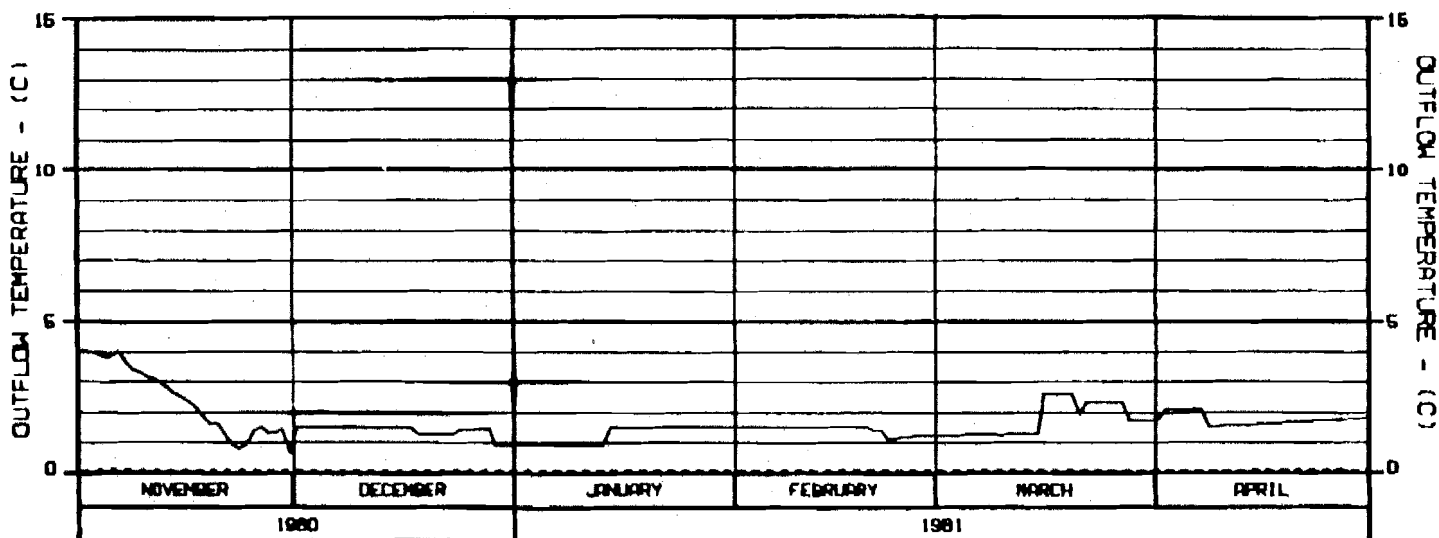
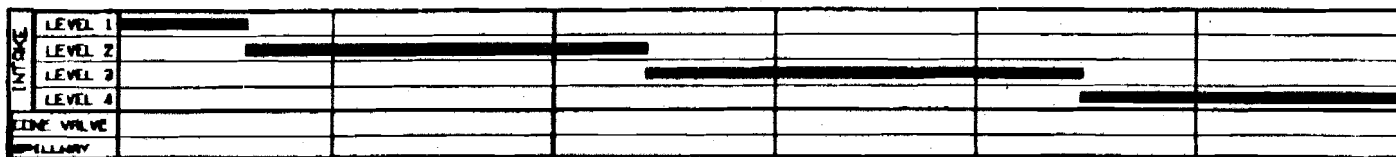
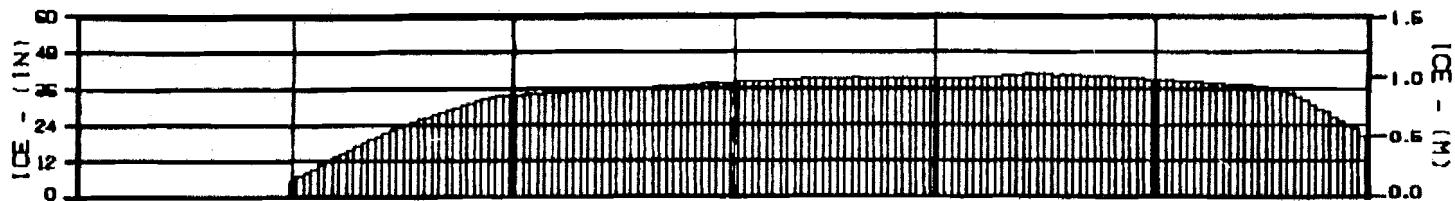
POWERHOUSE INTAKES

CASE: WAT7820A - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | MAY 1977
 - - - - - | JUNE 1977
 | JULY 1977

ALASKA POWER AUTHORITY	
DESIGN PROJECT	DESIGN MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBRACO JOINT VENTURE	
DATE: 11/10/77	42-010-04

EXHIBIT AH



LEGEND: CASE # WAB102120B - WATANA OPERATION WITH DEVIL CANYON IN 2020

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)

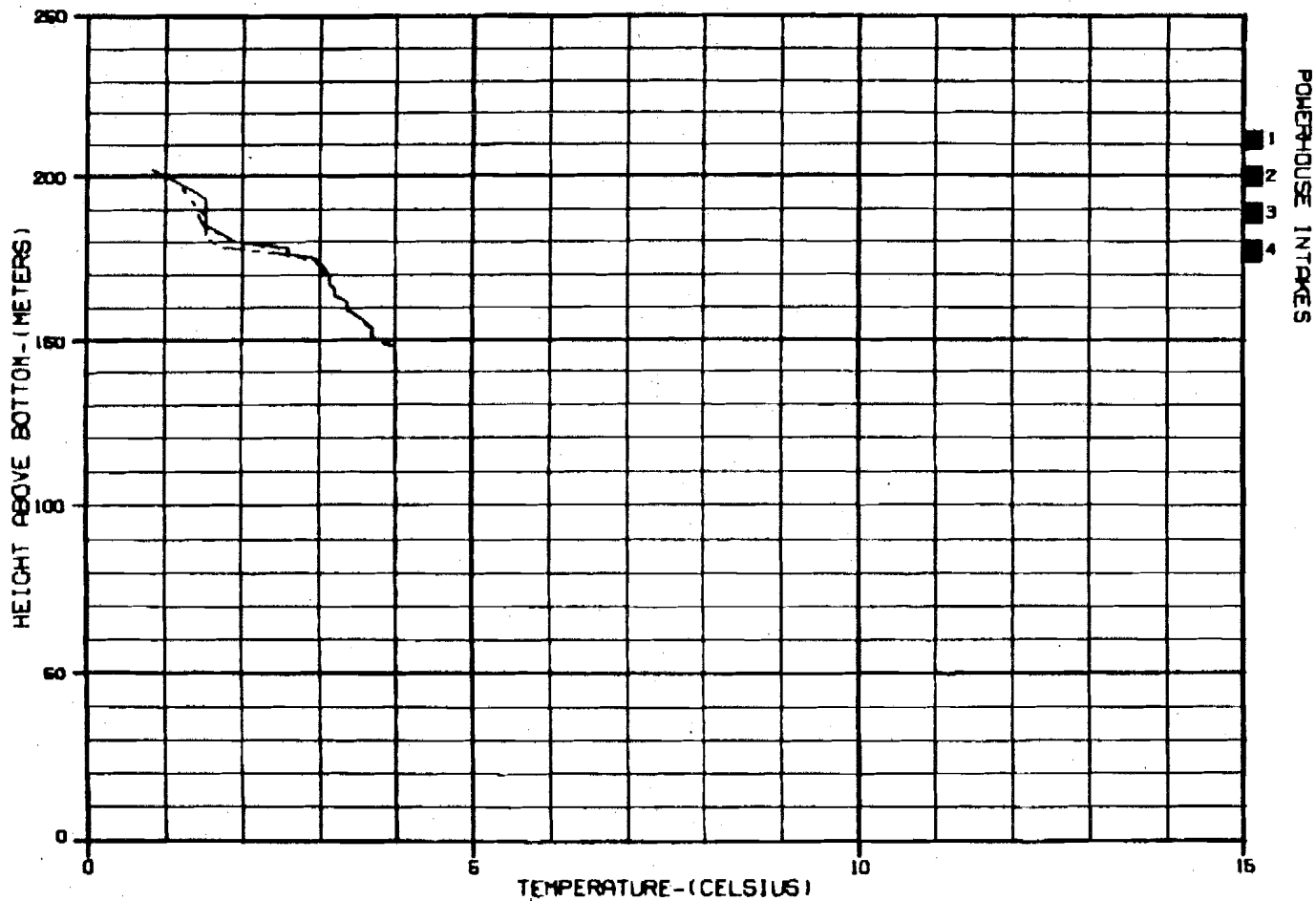
ALASKA POWER AUTHORITY

SLITINA PROJECT OPENING NO.

WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EPRI JOINT VENTURE

CHARGE: 11.1989 9 31 89 45-915-54



CASE: ■■ WAB11821208 - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

————— | FEBRUARY 1981
 - - - - - | MARCH 1981
 - · - · - | APRIL 1981

ALASKA POWER AUTHORITY

SUBITNA PROJECT

DYNOBA HEAD

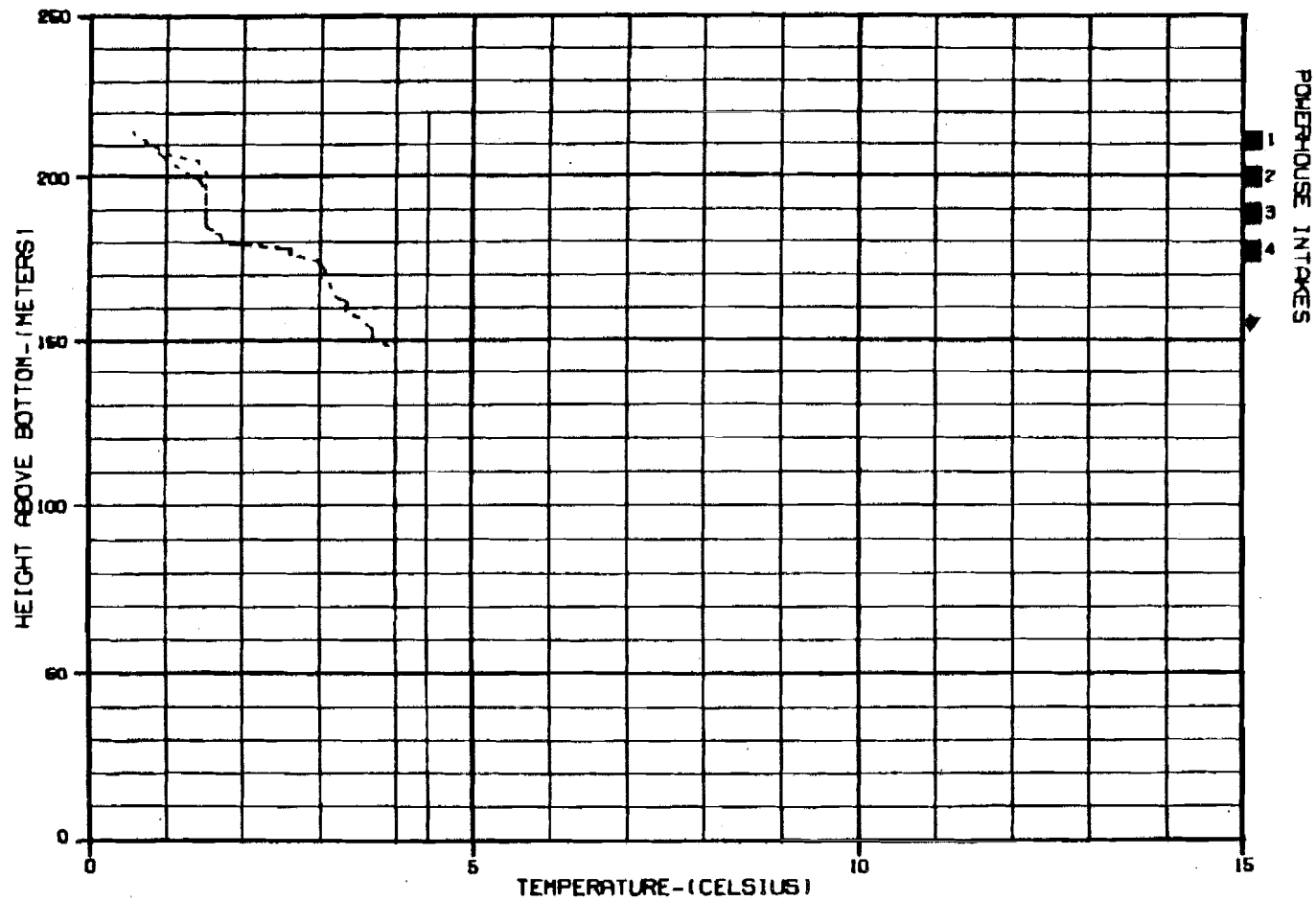
WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DRAWN: A.L. HARRIS

8 JAN 81

AE-010-04



CASE: WAB1182120B - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1980
- 1 DECEMBER 1980
- - - - 1 JANUARY 1981

ALASKA POWER AUTHORITY

WATANA PROJECT

OPEN MODEL

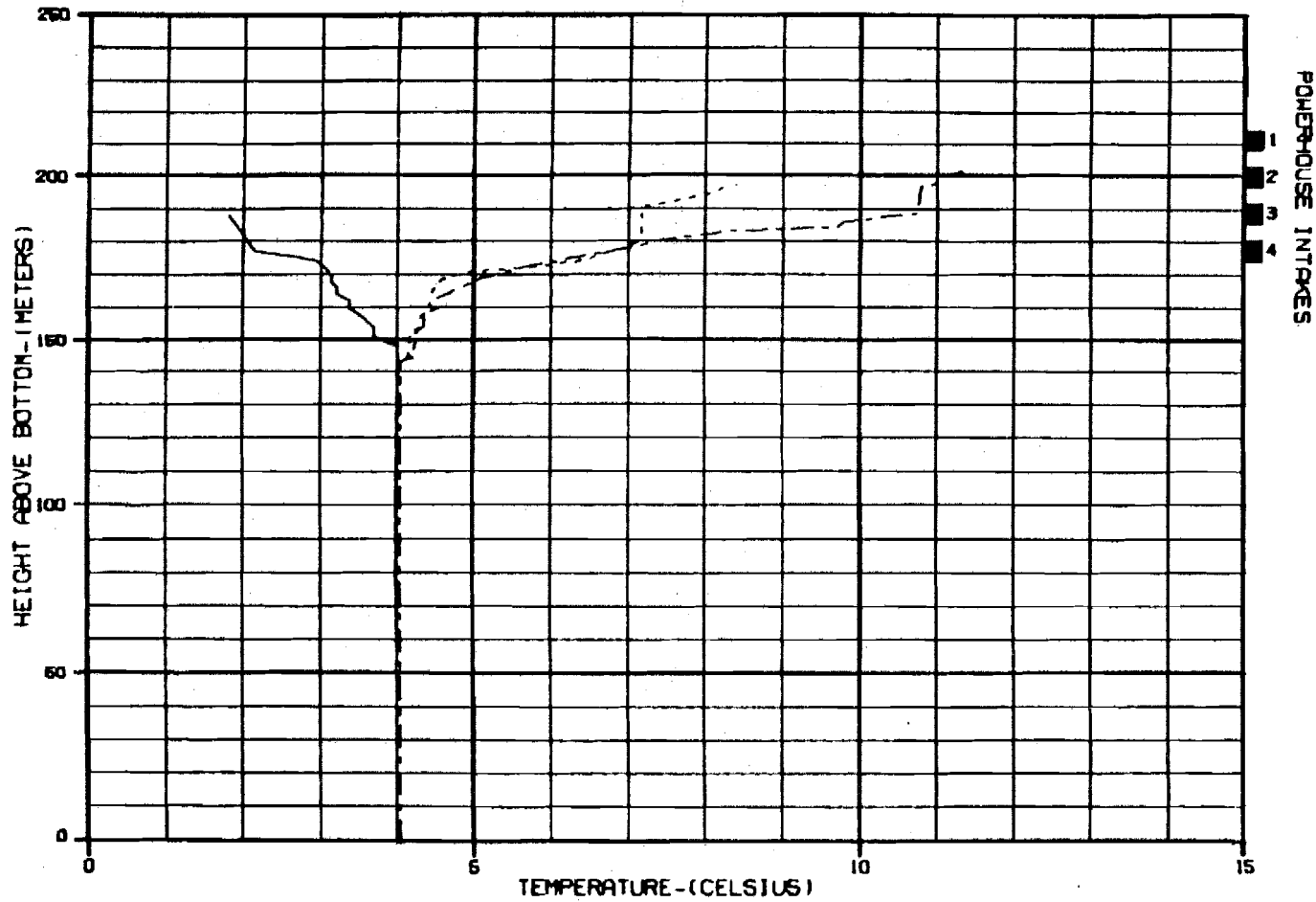
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DRAWN: S.L.PARK

9 JAN 81

42-010-04



POWERHOUSE INTAKES
1
2
3
4

CASE: ■■ WAB11B2120B - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 MAY 1981
- 1 JUNE 1981
- - - - 1 JULY 1981

ALASKA POWER AUTHORITY

SUBITNA PROJECT

OPERATION MODEL

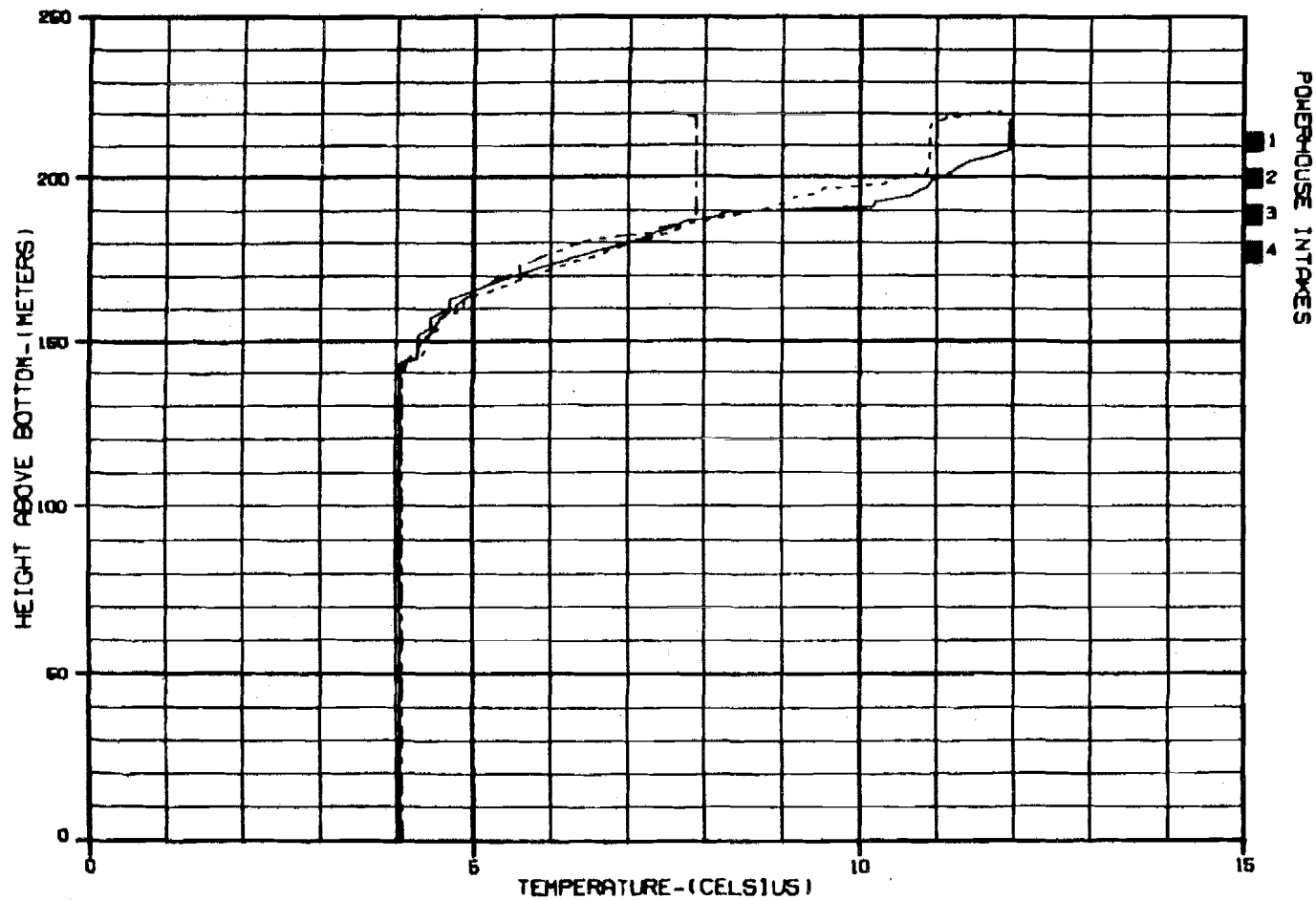
WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGN - ALLIANCE

8 JAN 84

42-010-04



CASE: ■■ WAB11B2120B - WATANA OPERATION WITH DEVIL CANYON IN 2020. ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 AUGUST 1981
 1 SEPTEMBER 1981
 - - - - - 1 OCTOBER 1981

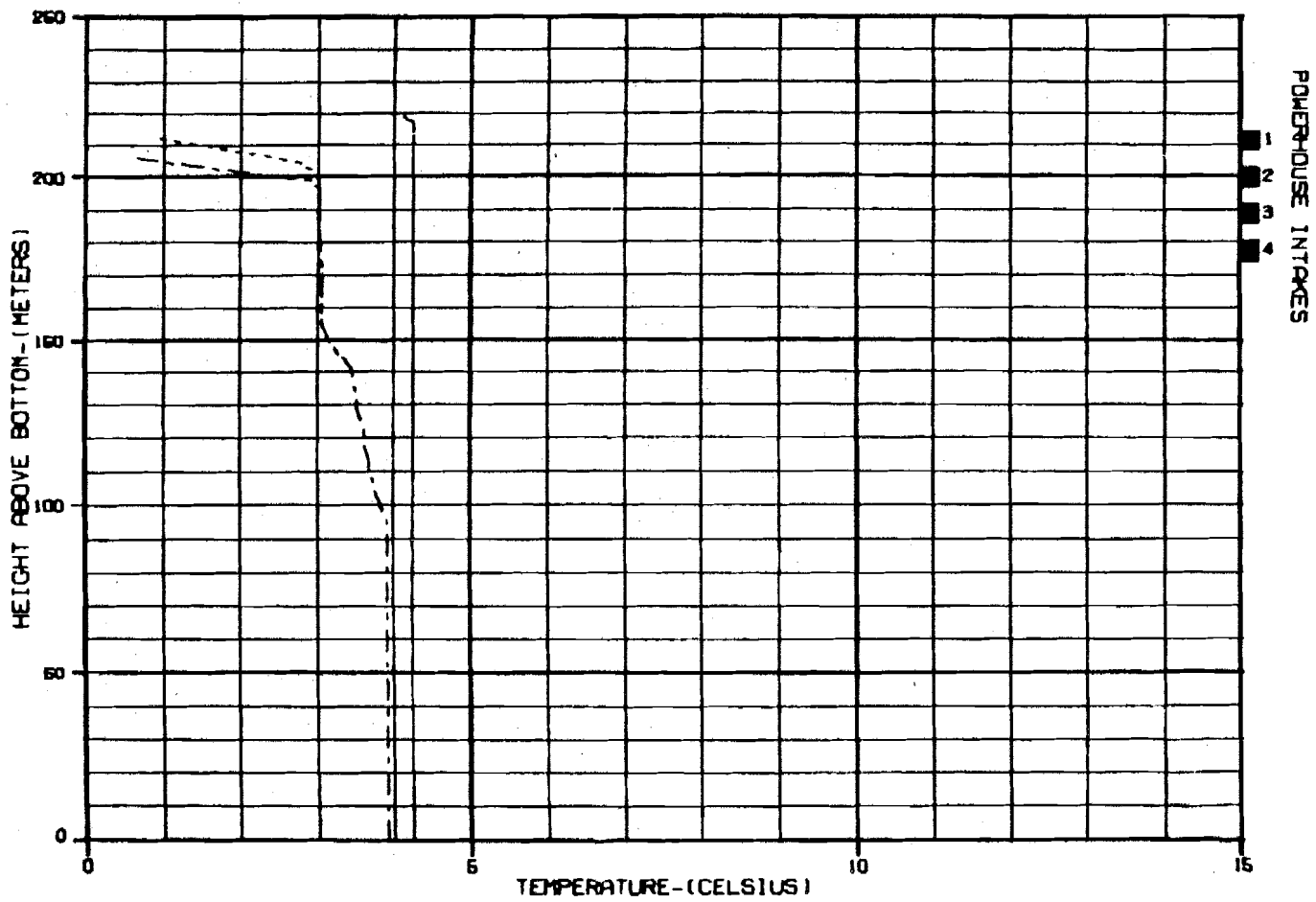
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DIVISION MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

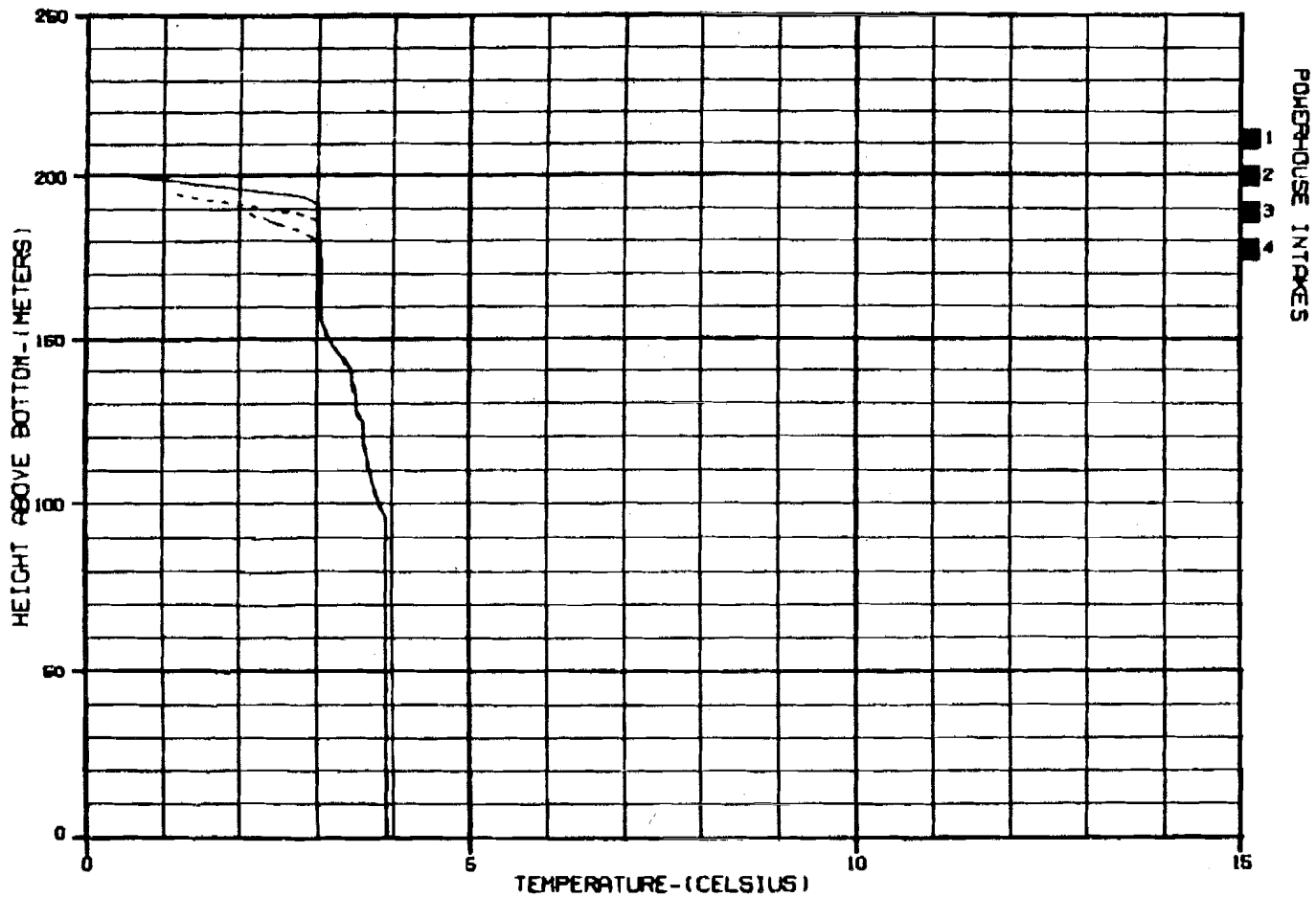
CHUCKER. B.L.H. 8 JAN 84 42-010-04



CASE: WAB11B2120B - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES.
 ———— | NOVEMBER 1981
 - - - - - | DECEMBER 1981
 - · - · - | JANUARY 1982

ALASKA POWER AUTHORITY	
DESIGN PROJECT	OFFICE MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
DATE: 11/19/81	42-010-04



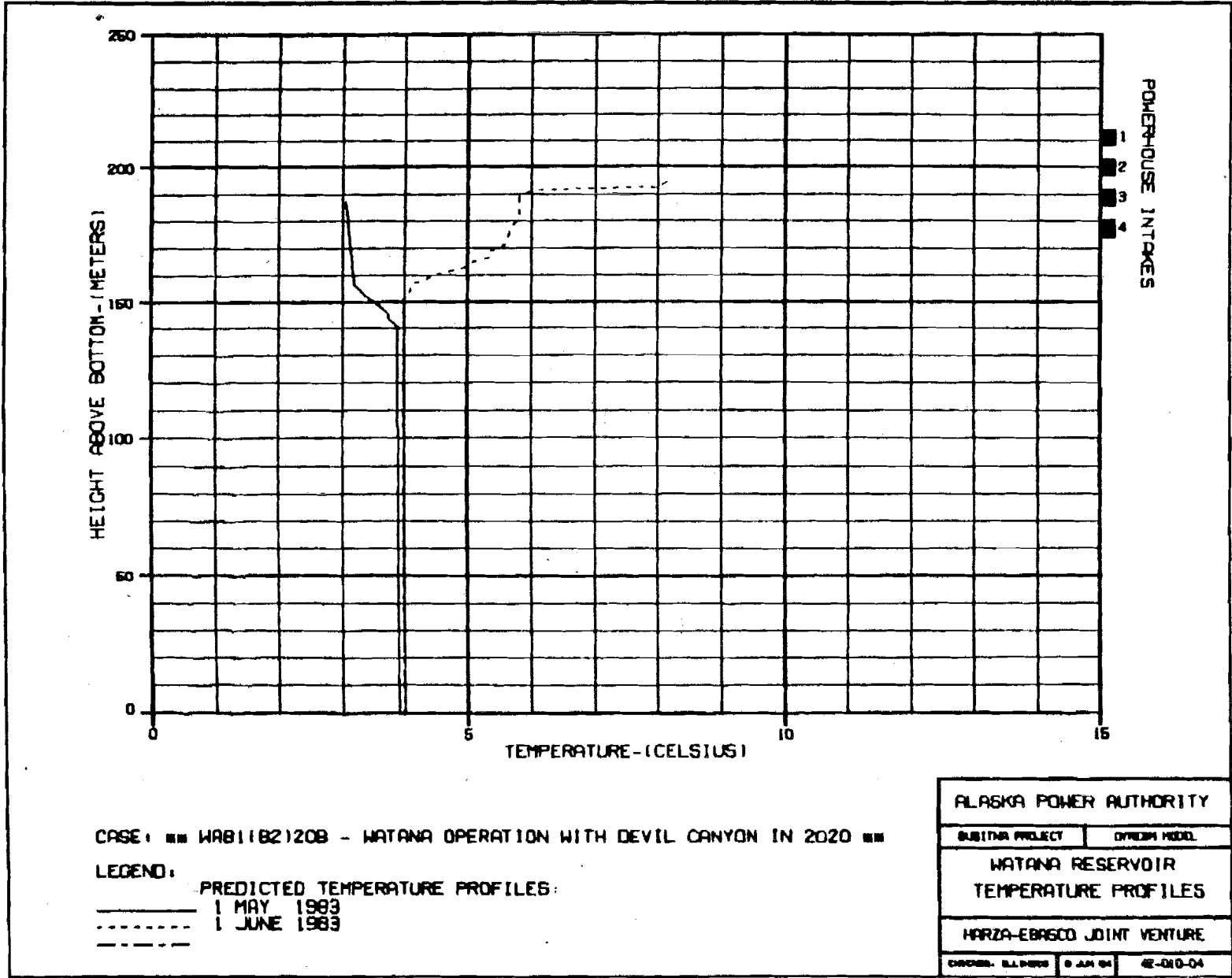
POWERHOUSE INTAKES

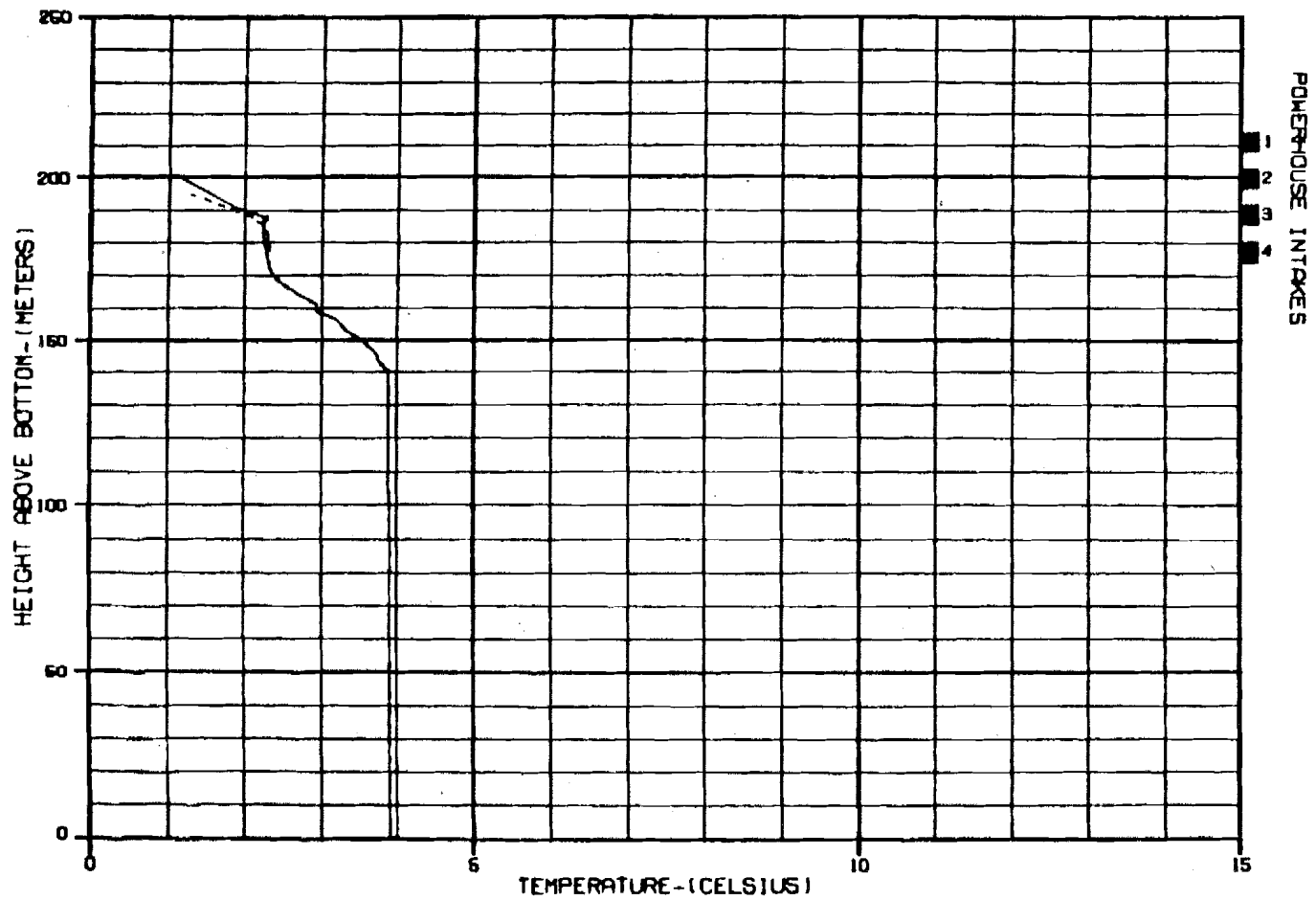
CASE: WAB11821208 - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 FEBRUARY 1982
 - - - - - 1 MARCH 1982
 - · - · - 1 APRIL 1982

ALASKA POWER AUTHORITY		
DESIGN PROJECT	DYNEMA MODEL	
WATANA RESERVOIR TEMPERATURE PROFILES		
WARZA-EBERCO JOINT VENTURE		
DATE: 11/19/82	BY: JAM/BA	42-010-04

EXHIBIT AI





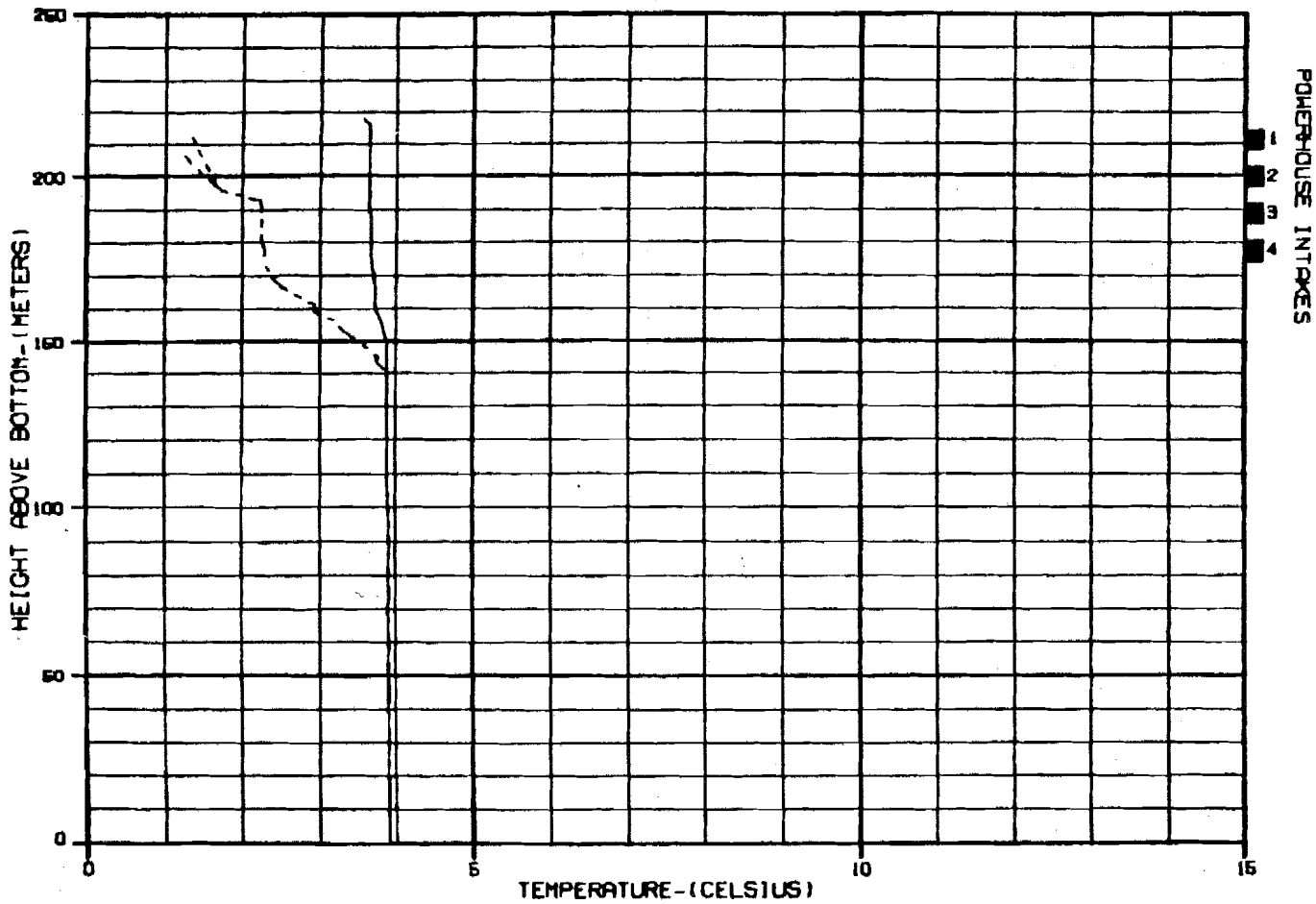
CASE: ■■ WAB11B2120B - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 FEBRUARY 1983
- 1 MARCH 1983
- - - 1 APRIL 1983

ALASKA POWER AUTHORITY	
SUBMITTA PROJECT	CPREH PROJ.
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
ENCLOS. 5/1/83	42-010-04



CASE: ■■ WAB11821208 - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1982
- - - 1 DECEMBER 1982
- · - · 1 JANUARY 1983

ALASKA POWER AUTHORITY

WATANA PROJECT

OPENING MODEL

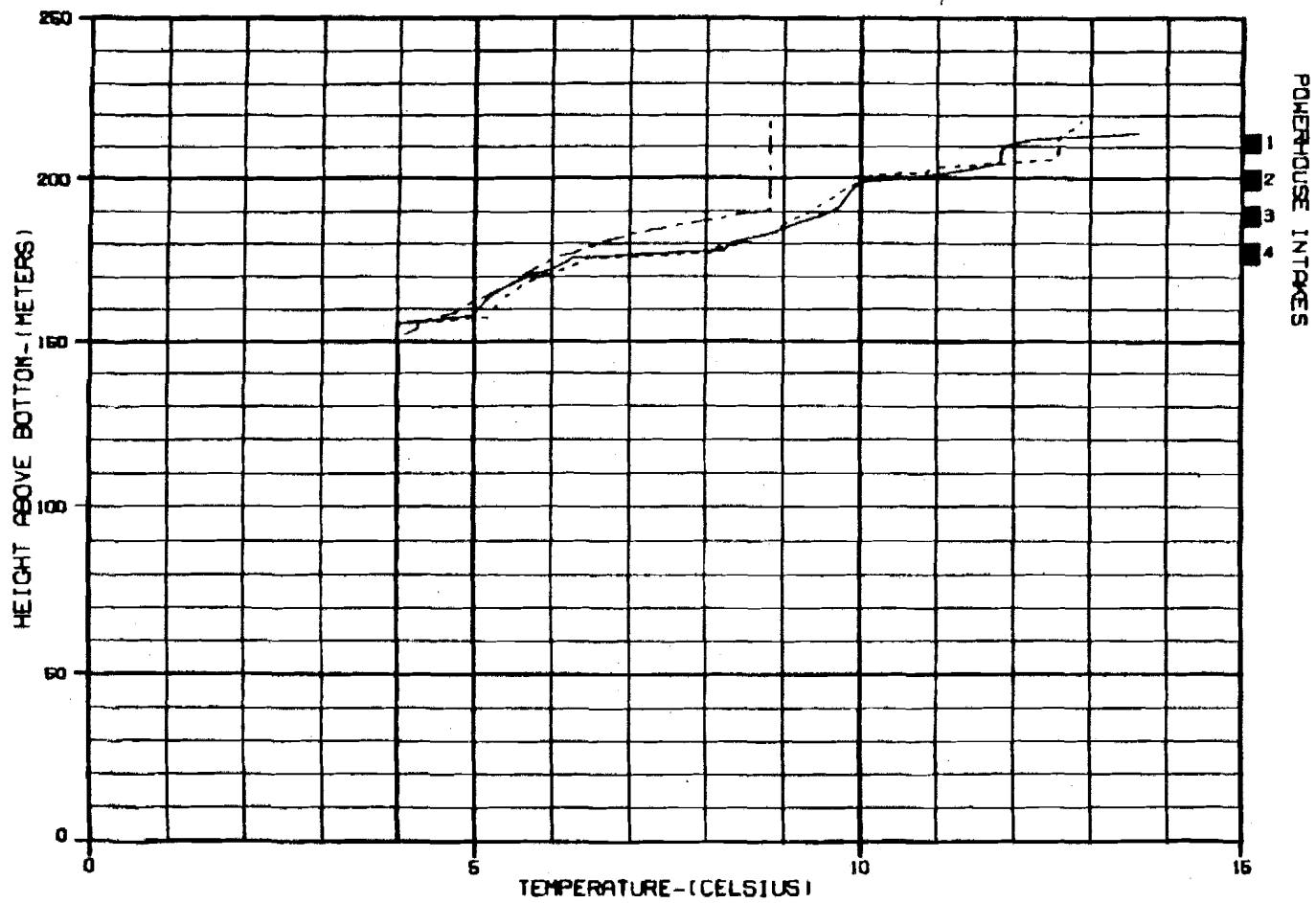
WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

CHUCK R. LINDEN

9 JAN 83

4E-010-04



CASE: WAB11821208 - WATANA OPERATION WITH DEVIL CANYON IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 AUGUST 1982
 - - - - - 1 SEPTEMBER 1982
 - . - . - 1 OCTOBER 1982

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

DATA MODEL

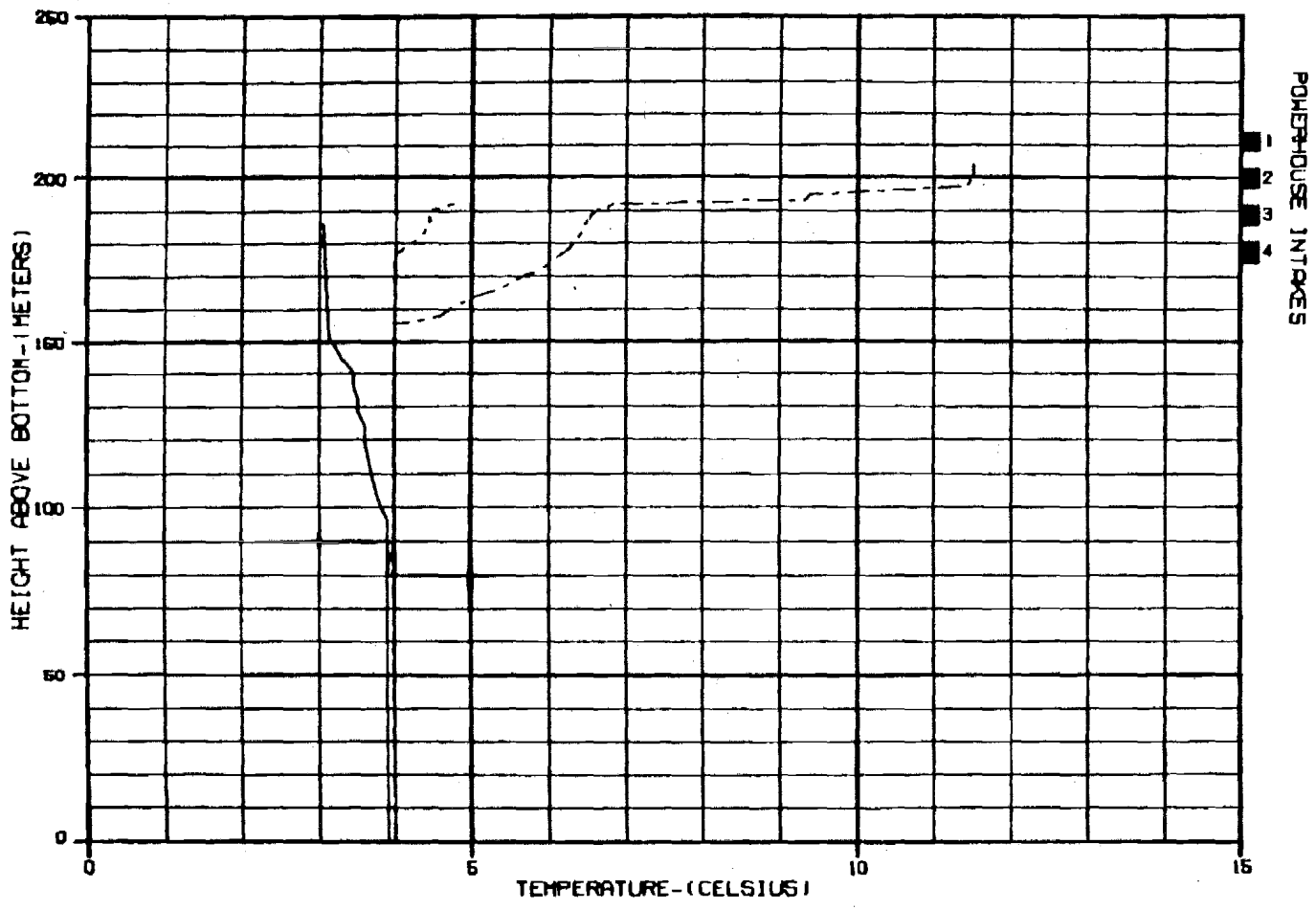
WATANA RESERVOIR
TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

DESIGN - D.L. BROWN

8 JAN 83

42-010-04

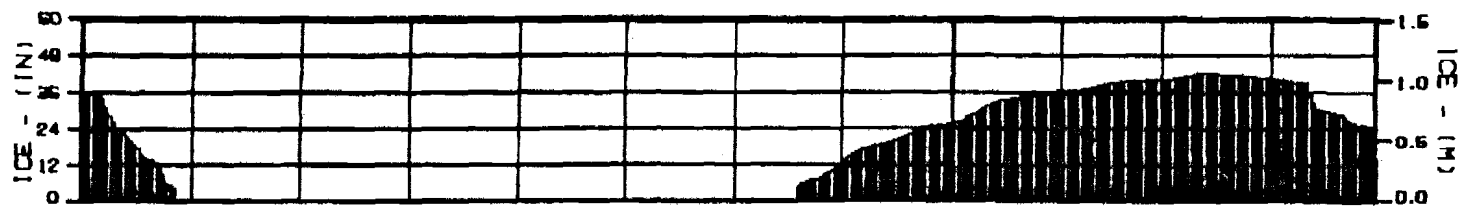


POWERHOUSE INTAKES

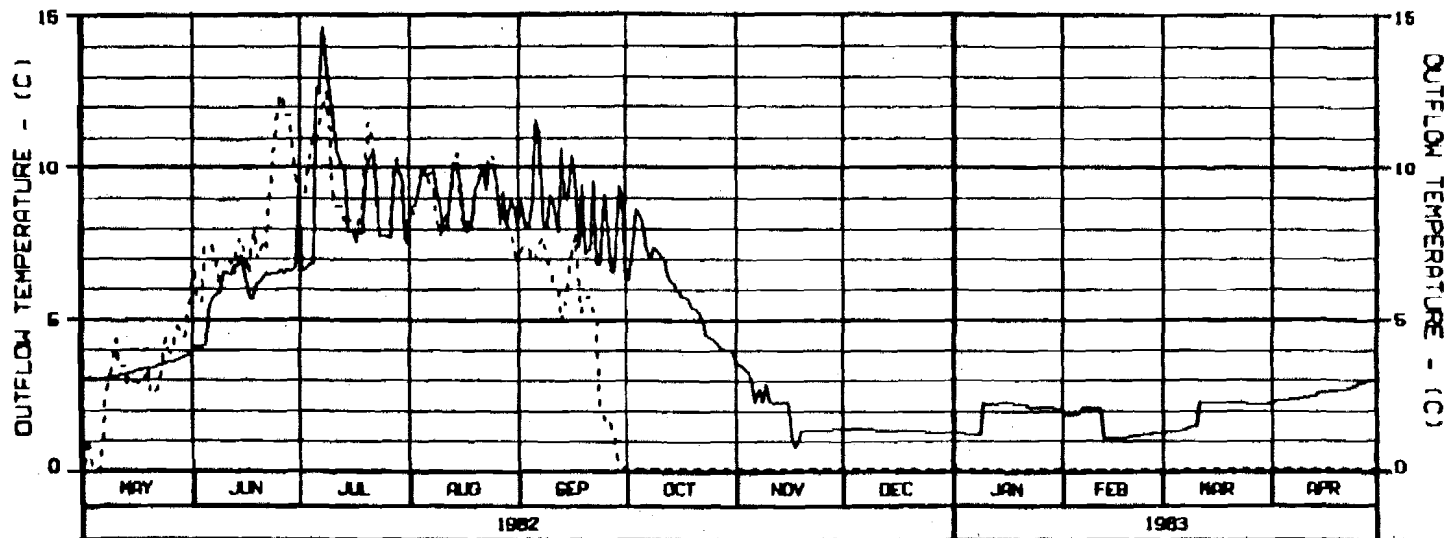
CASE: ■■ WAB11821208 - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ 1 MAY 1982
 1 JUNE 1982
 - - - - - 1 JULY 1982

ALASKA POWER AUTHORITY	
SUBMITTA PROJECT	OPERATION MODEL
WATANA RESERVOIR TEMPERATURE PROFILES	
WARZA-EBASCO JOINT VENTURE	
DATE: 01.11.82	REV: 01.01.84



INTAKE	LEVEL 1																			
	LEVEL 2																			
	LEVEL 3																			
	LEVEL 4																			
	CONE VALVE																			
	SPILLWAY																			



LEGEND: CASE: ■■ HAR11821208 - WATANA OPERATION WITH DEVIL CANYON IN 2020 ■■

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (656.6 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.9 M)
 5. CONE VALVE AT ELEVATION 2040 FT (621.9 M)
 6. SPILLWAY CREST AT ELEVATION 2149 FT (654.7 M)

ALASKA POWER AUTHORITY

WATANA PROJECT DYWIDAG MODEL

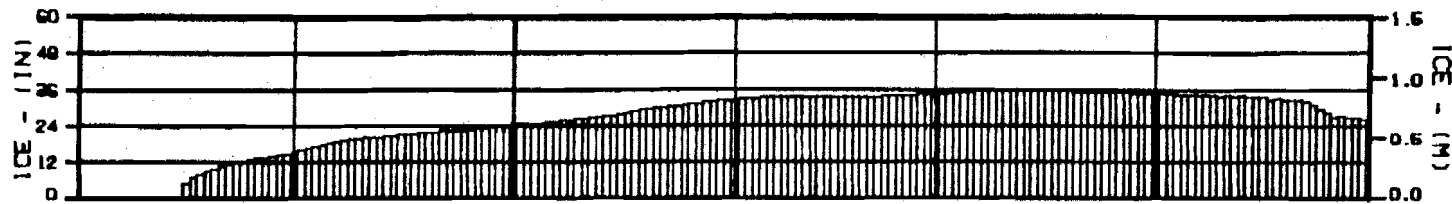
WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

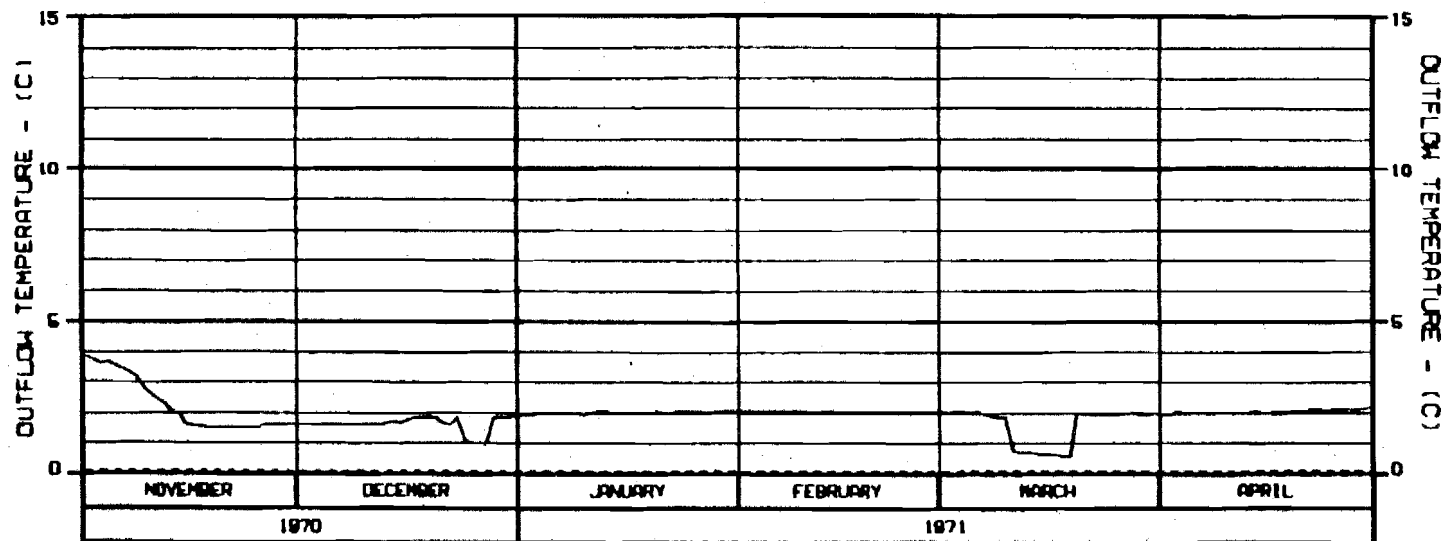
CHANGES: ALL DATED 8 JAN 83 48-000-04

WATANA AND DEVIL CANYON OPERATING
2002 Energy Demands
Devil Canyon Reservoir Temperatures

EXHIBIT AJ



INTAKE	LEVEL 1					
	LEVEL 2					
	CONE VALVE					
	SPILLWAY					



LEGEND: DASH: ■ DC7102A - DEVIL CANYON OPERATION WITH MATANA IN 2002 ■

— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.34 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1276 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

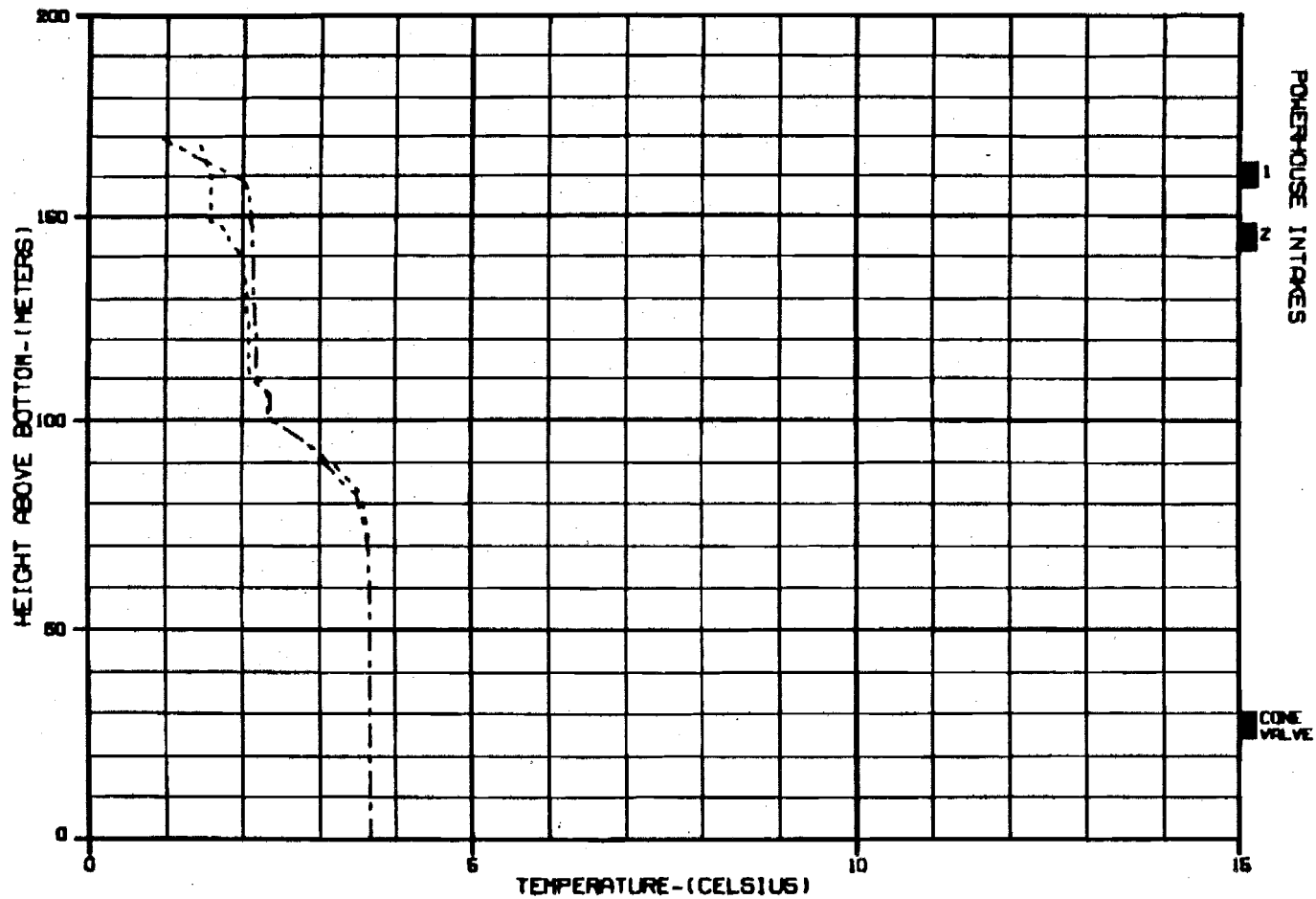
ALASKA POWER AUTHORITY

BUSHTNA PROJECT | DYNEM MODEL

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

CHECKED: 11.13.00 8 AM 04 1000.147.45.010.04



CASE: ■■ DC7102A - DEVIL CANYON OPERATION WITH MATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | NOVEMBER 1970
 | DECEMBER 1970
 - - - - - | JANUARY 1971

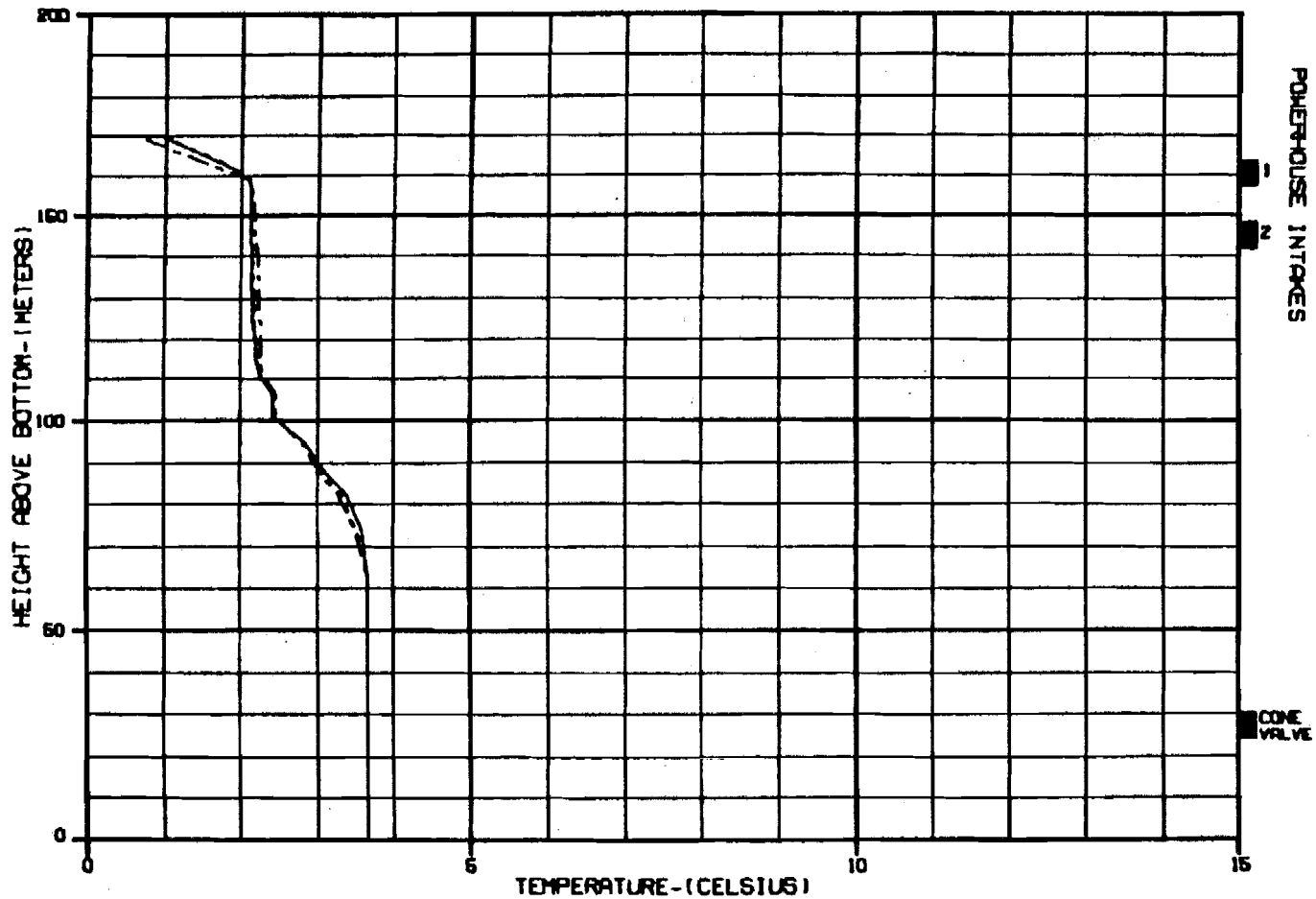
ALASKA POWER AUTHORITY

SUBMITTA PROJECT OPERAION NEEDL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRACCO JOINT VENTURE

DATE: 11/10/70 0 JAN 71 42-010-04



CASE: # DC7102A - DEVIL CANYON OPERATION WITH WATANA IN 2002 #

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— | FEBRUARY 1971
 - - - - - | MARCH 1971
 - · - · - | APRIL 1971

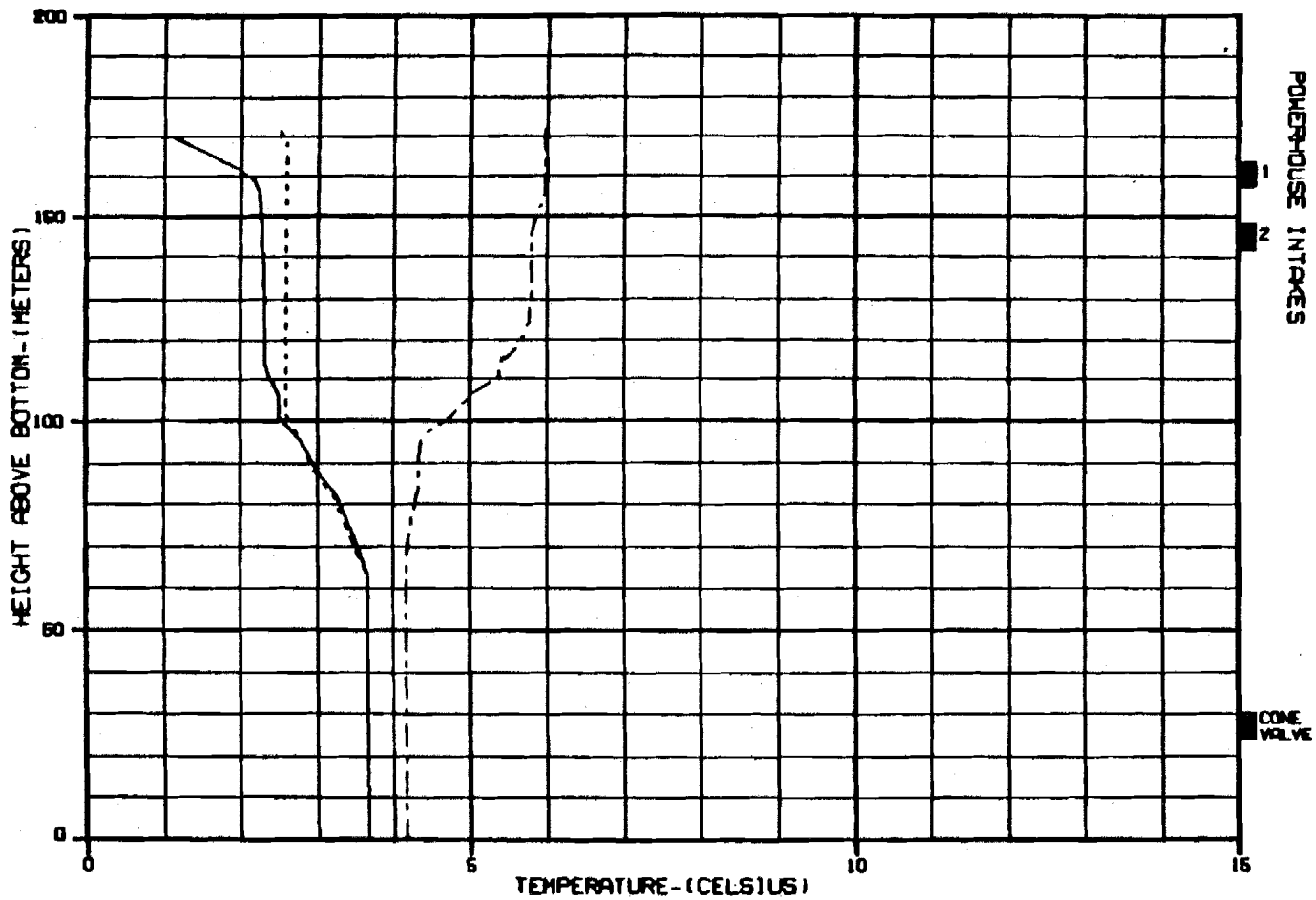
ALASKA POWER AUTHORITY

STARTING PROJECT	OPEN MODEL
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DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DATE: 11/28/71	BY: JJK	42-010-04
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CASE: ■■ DC7102A - DEVIL CANYON OPERATION WITH MATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— 1 MAY 1971
 - - - - - 1 JUNE 1971
 - · - · - 1 JULY 1971

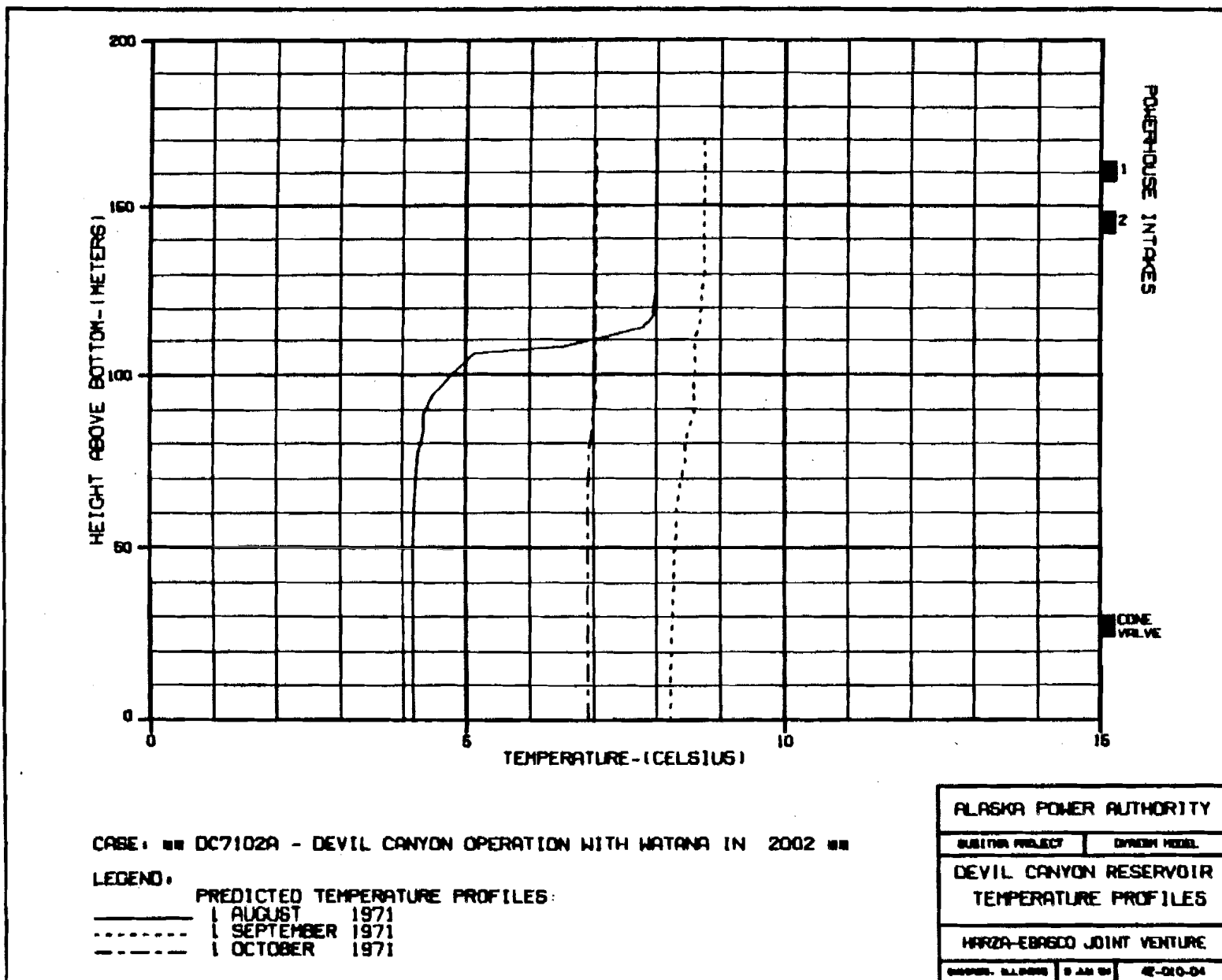
ALASKA POWER AUTHORITY

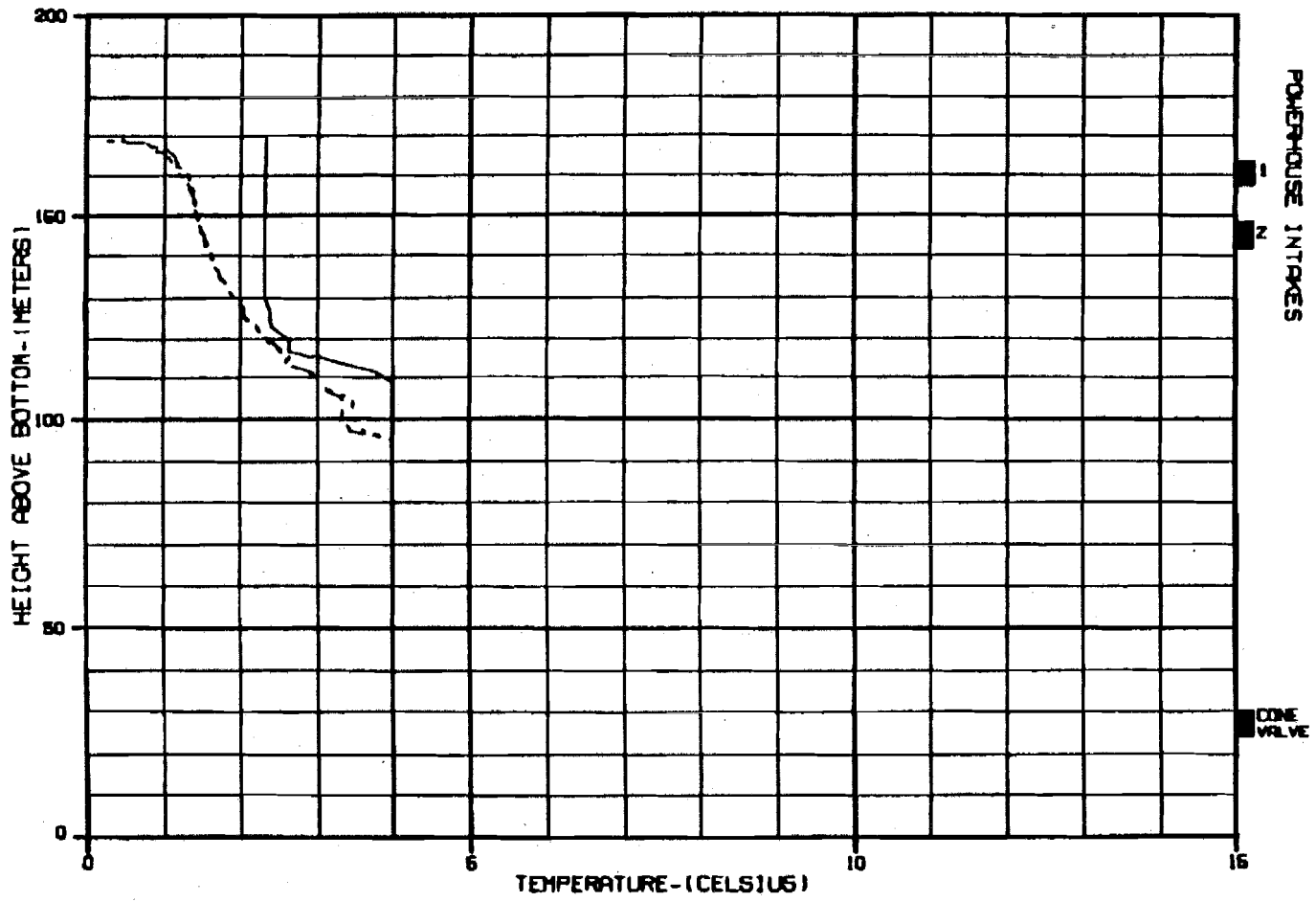
SUBMITTAL PROJECT | UPRONG RESER.

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

ISSUED - ALASKA | 8 JAN 81 | 42-010-04

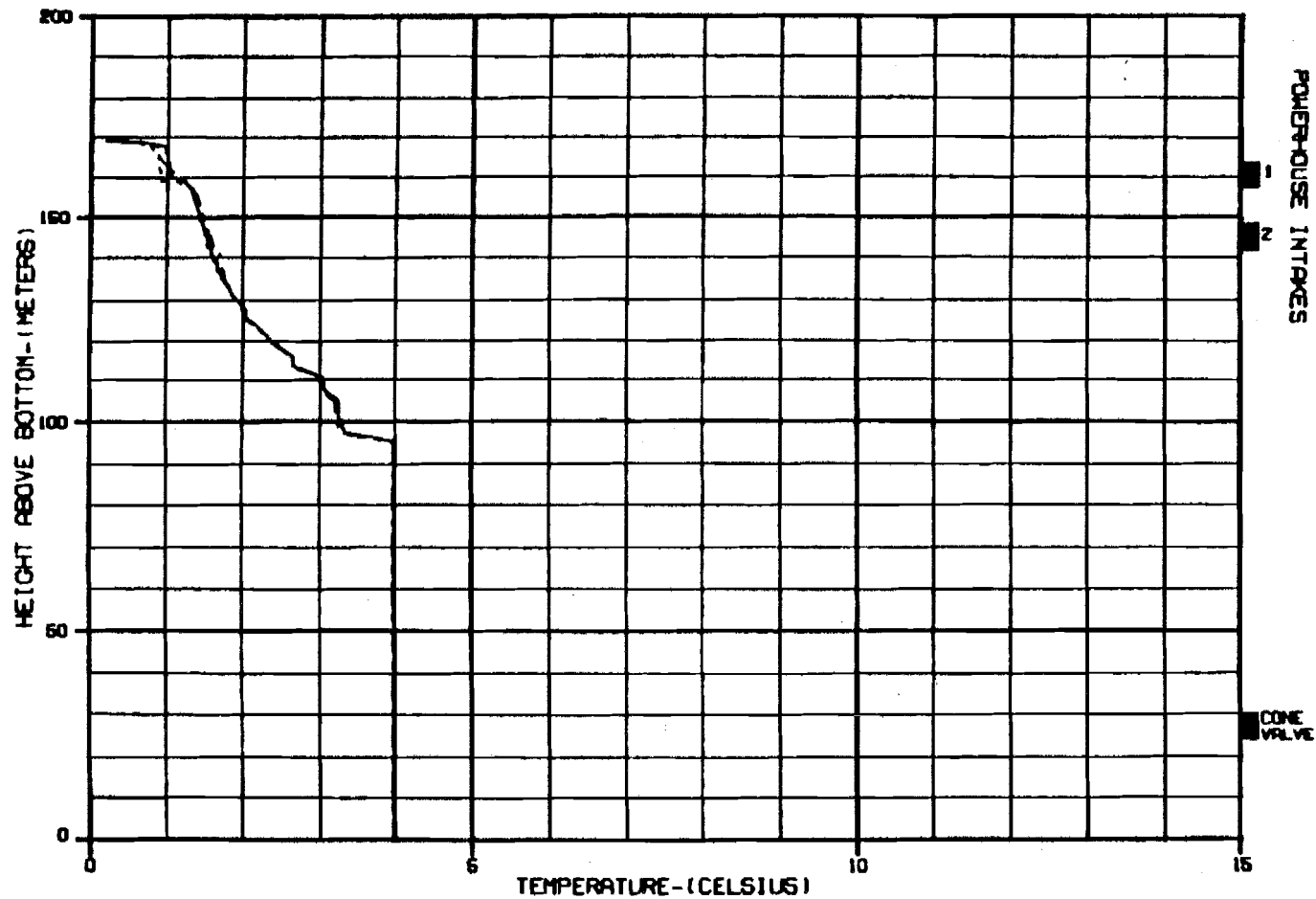




CASE: ■■ DC7102A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1971
 | DECEMBER 1971
 - - - - | JANUARY 1972

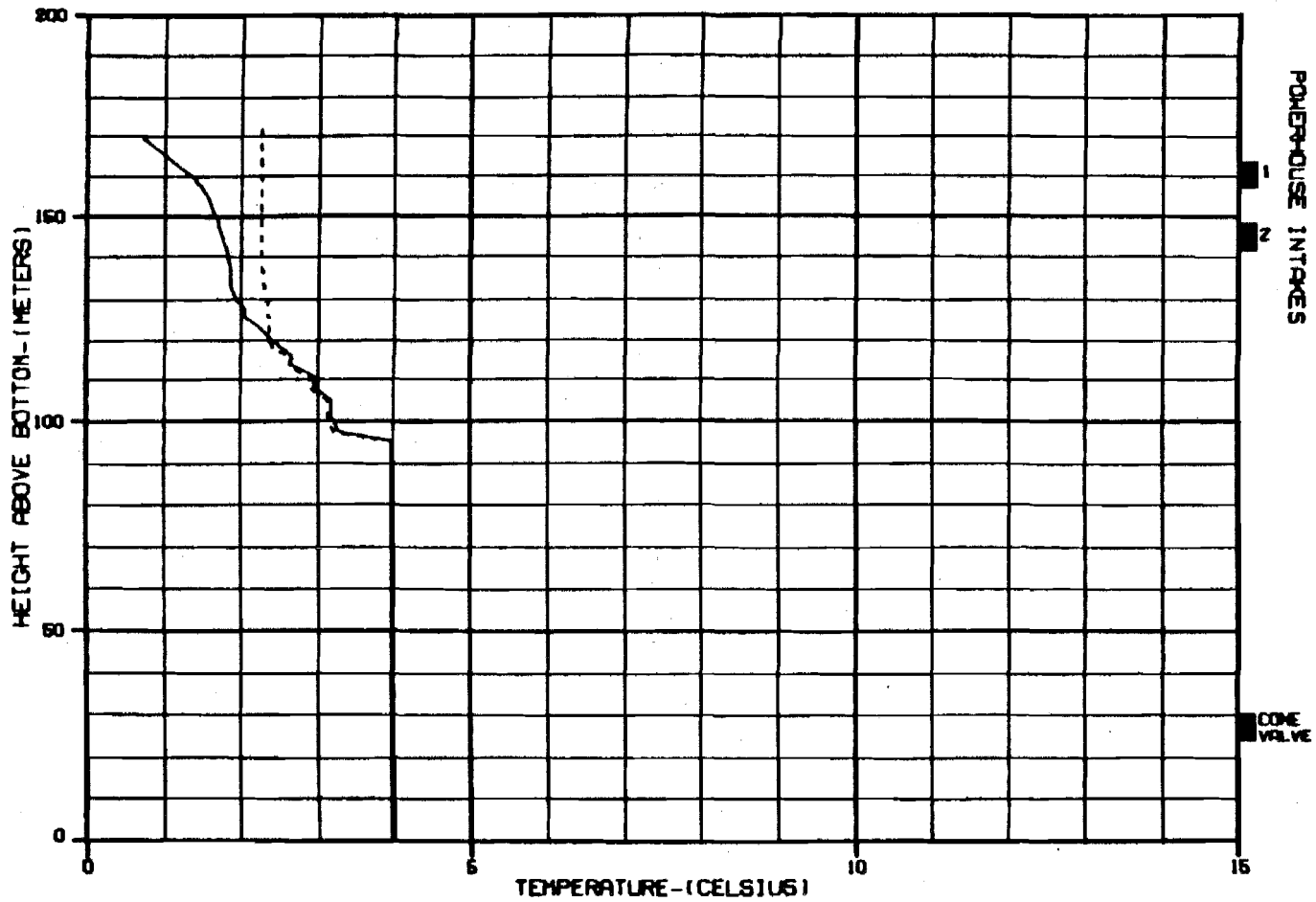
ALASKA POWER AUTHORITY		
UNIT/PROJECT	DIVISION/REG. NO.	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
MARZA-EBRISCO JOINT VENTURE		
DATE/REV.	BY/CHK	APP/DATE
		42-010-04



CASE: DC7102A - DEVIL CANYON OPERATION WITH WATANA IN 2002

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1972
 - - - - - | MARCH 1972
 - · - · - | APRIL 1972

ALASKA POWER AUTHORITY		
OWNER PROJECT	OWNER NAME	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
WARZA-EBRACO JOINT VENTURE		
DESIGNED: S.L. HARRIS	DRAWN: S. J. J. J.	DATE: 8-21-04



CASE: ■■ DC7102A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

————— | MAY 1972
 - - - - - | JUNE 1972
 ········ | JULY 1972

ALASKA POWER AUTHORITY

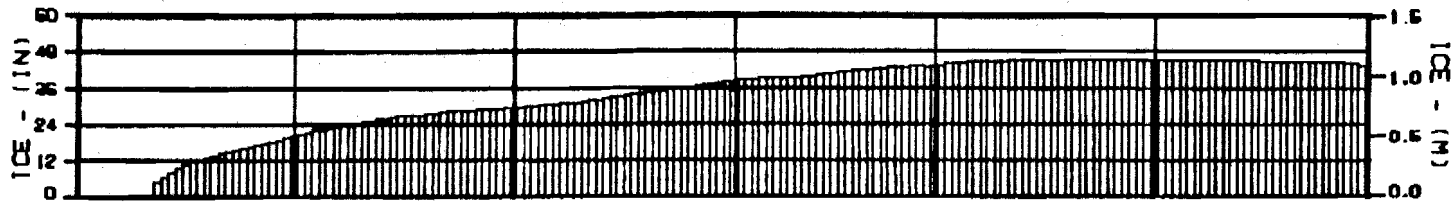
SUBMITTA PROJECT | DASHEN MODEL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

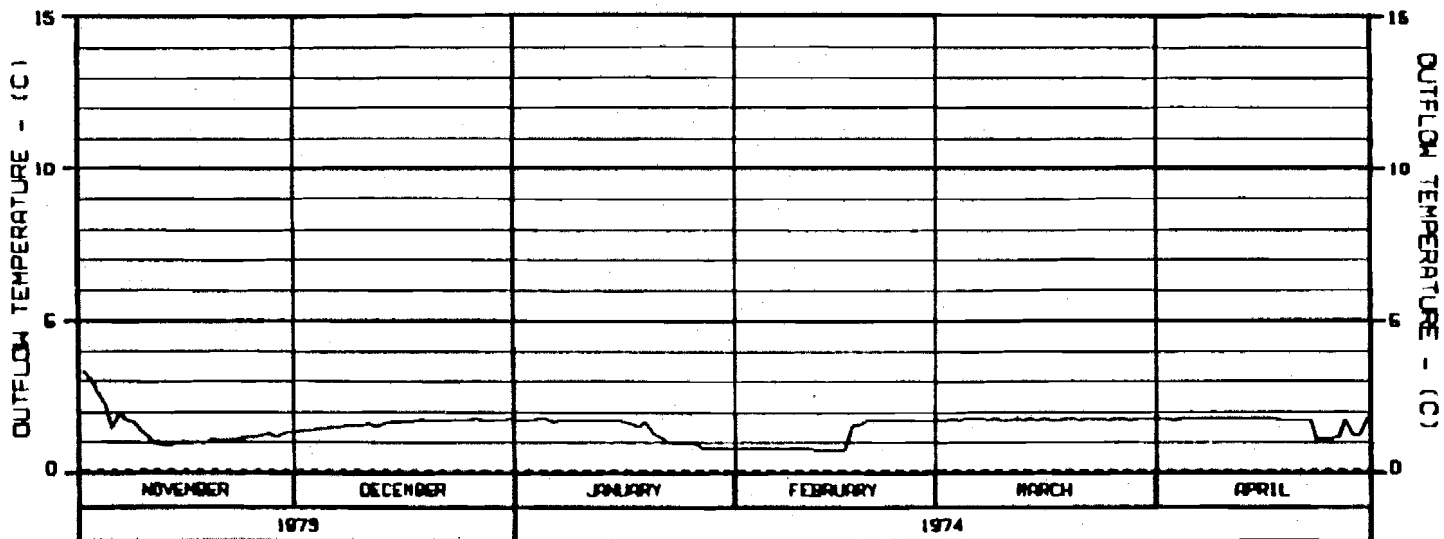
HARZA-EBASCO JOINT VENTURE

ISSUES - 04/0000 | 0 JAN 83 | 42-010-04

EXHIBIT AK



INTAKE	LEVEL 1					
	LEVEL 2					
	CONE VALVE					
	SPILLWAY					



LEGEND: CASE: ■ DC7402A - DEVIL CANYON OPERATION WITH NATANA IN 2002 ■■

— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO NATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1425 FT (434.24 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1376 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.84 M)

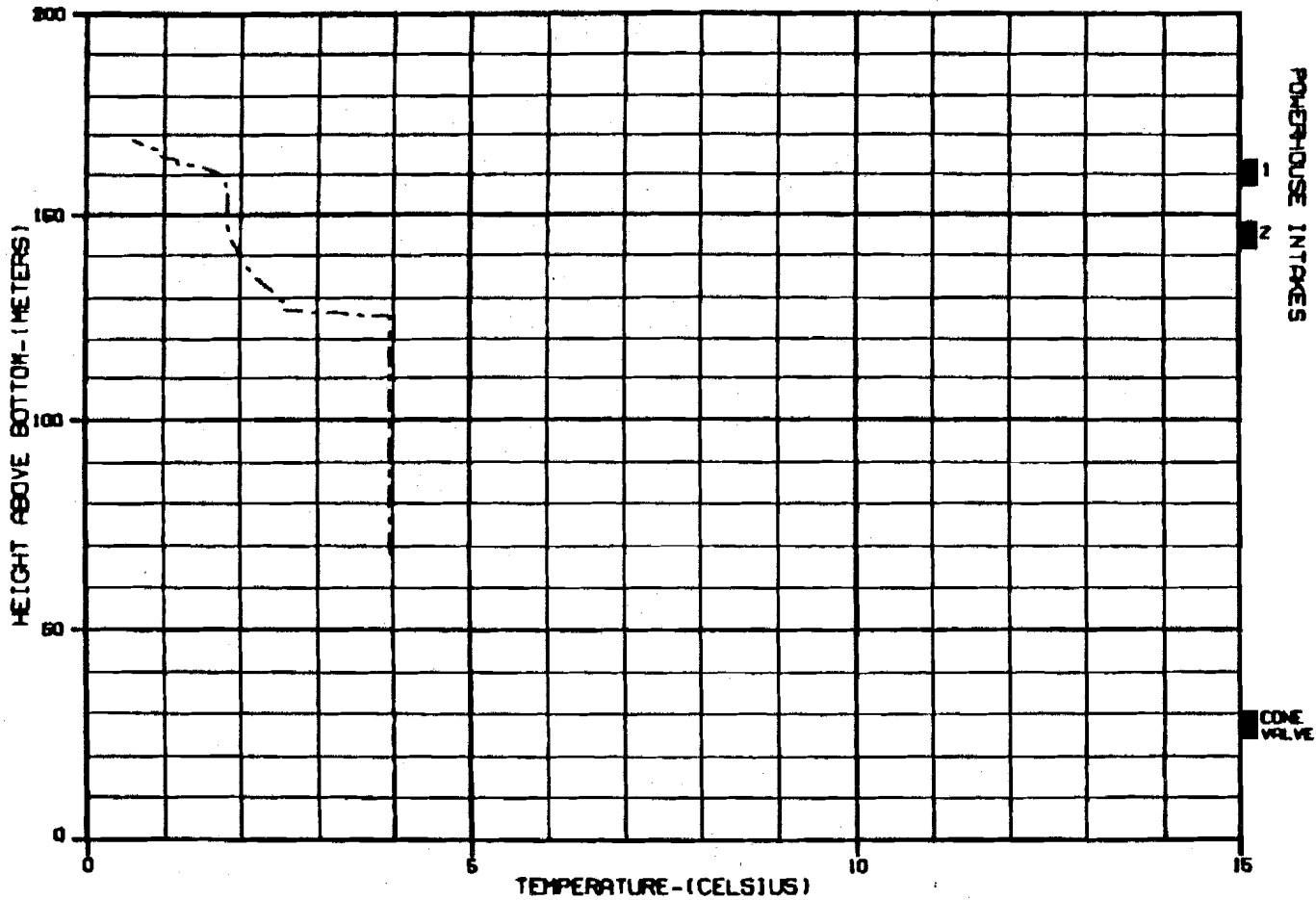
ALASKA POWER AUTHORITY

BUSIENR PROJECT DESIGN MODEL

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBRSCO JOINT VENTURE

UNCONF. ALL RIGHTS RESERVED 8 JAN 84 SHEET NO. 42-002-04



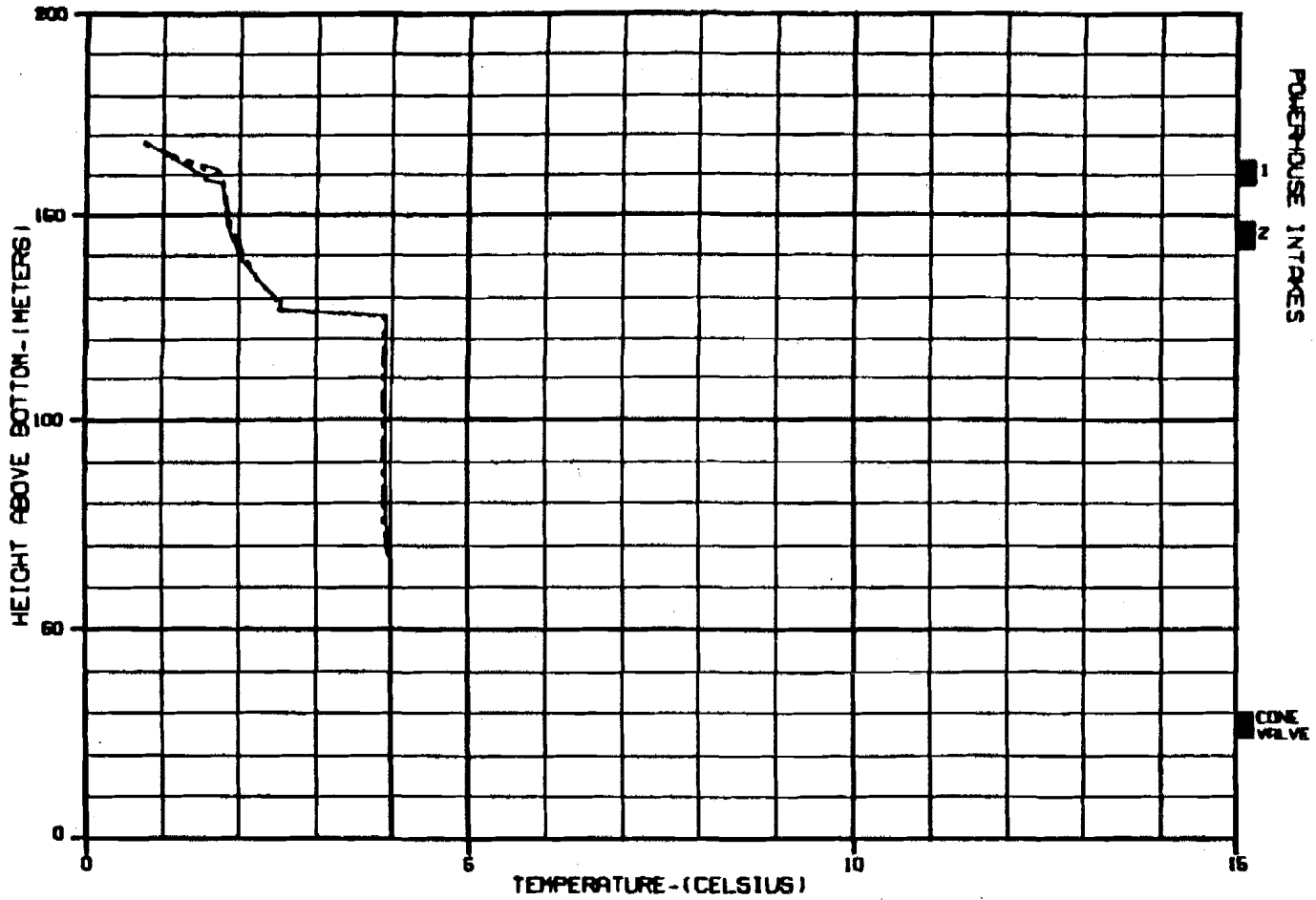
CASE: ■■■ DC7402A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- NOVEMBER 1973
- DECEMBER 1973
- - - - - JANUARY 1974

ALASKA POWER AUTHORITY	
DISTRIBUTION PROJECT	OPERATION MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
HARZA-EBRARD JOINT VENTURE	
DATE: 11-01-80	42-010-04



CASE: # DC7402A - DEVIL CANYON OPERATION WITH WATANA IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- FEBRUARY 1974
- - - MARCH 1974
- · · APRIL 1974

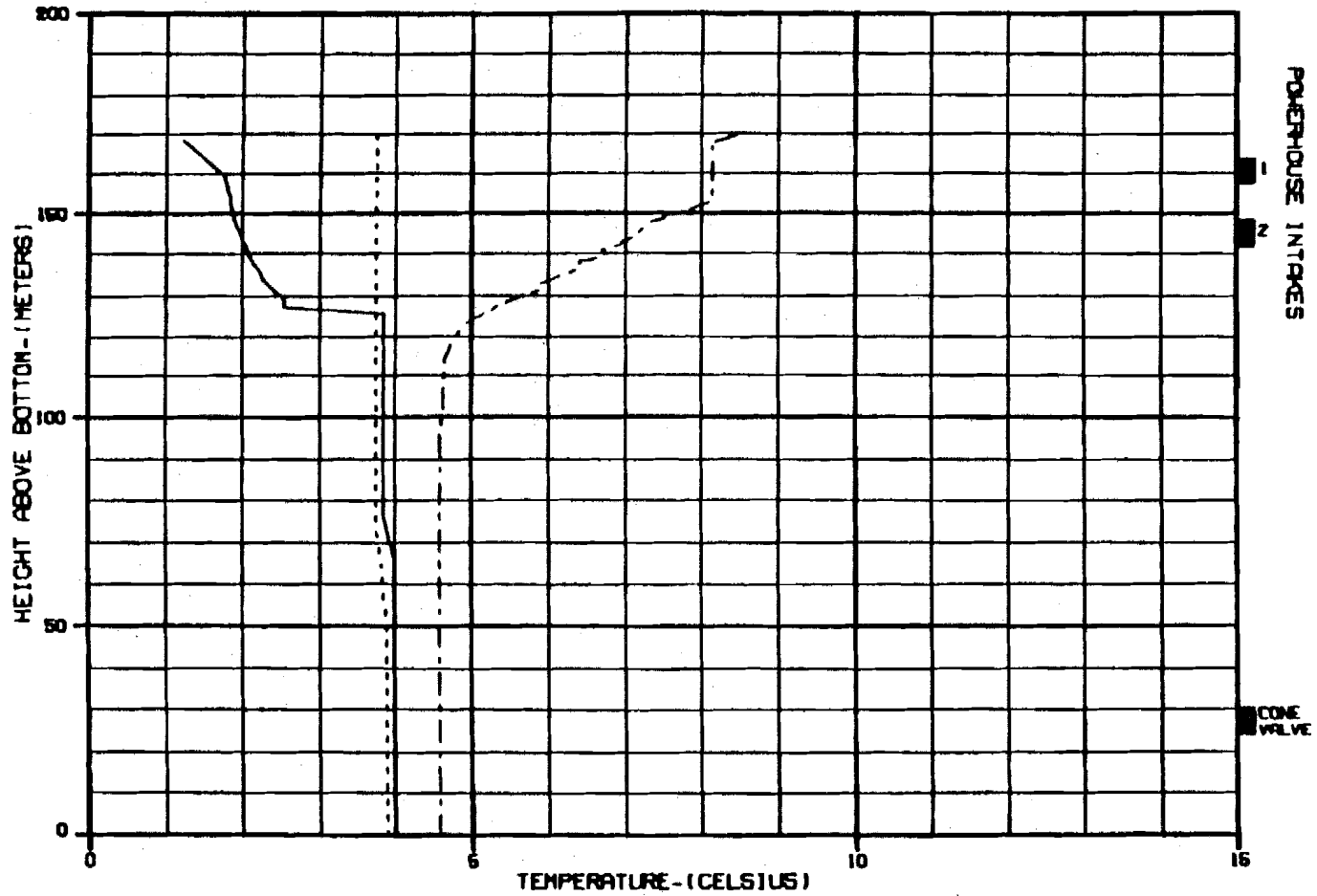
ALASKA POWER AUTHORITY

UNITED PROJECT OPENING MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRDC JOINT VENTURE

OWNER: ALASKA POWER AUTHORITY 47-010-04



CASE: ■■ DC7402A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- MAY 1974
- JUNE 1974
- - - - JULY 1974

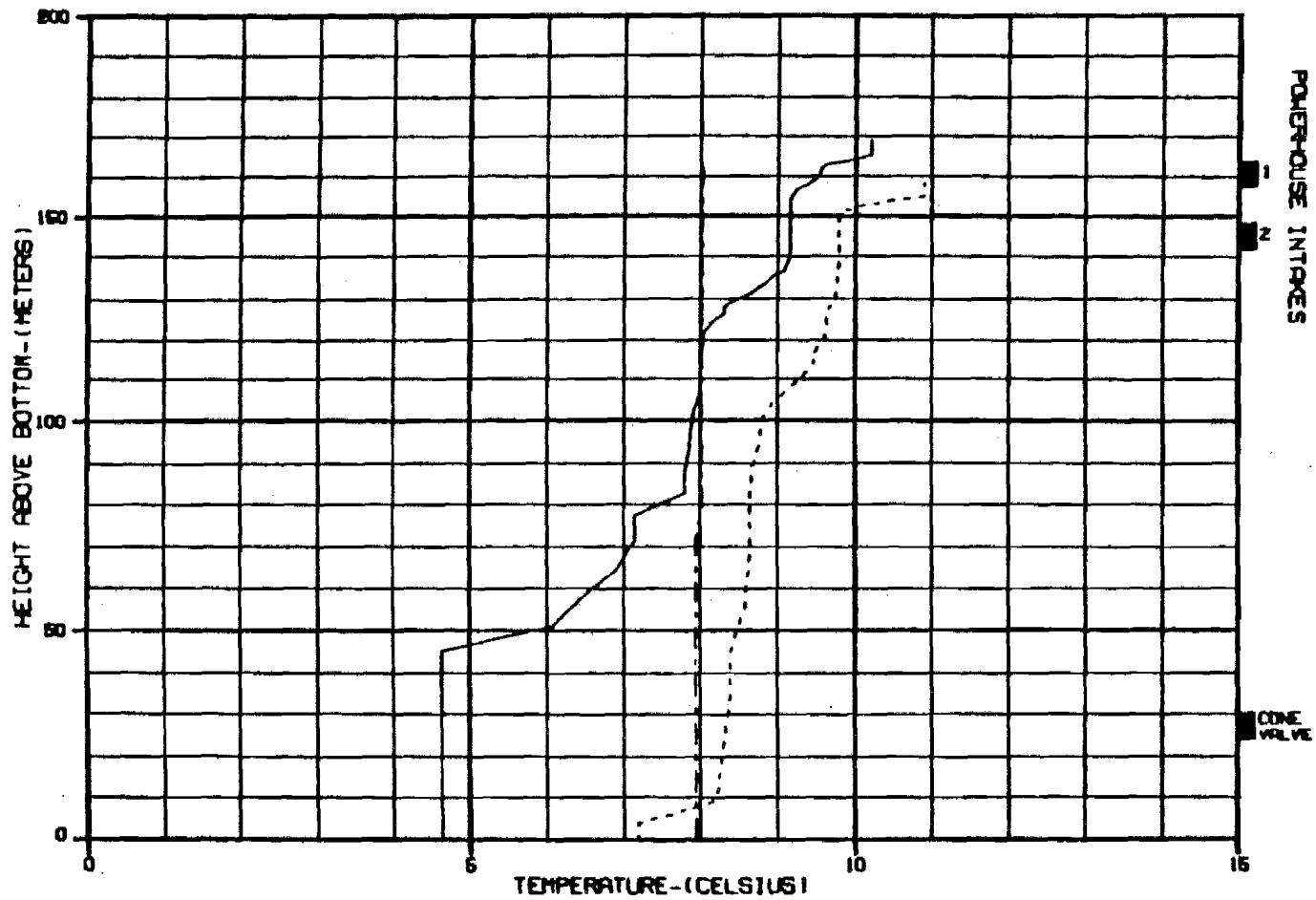
ALASKA POWER AUTHORITY

SUBMITTER PROJECT OPERATOR NAME

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

WARZA-EBRARD JOINT VENTURE

ORDER NUMBER DATE 42-010-04



CASE: ■ DC7402A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— | AUGUST 1974
 | SEPTEMBER 1974
 - - - - | OCTOBER 1974

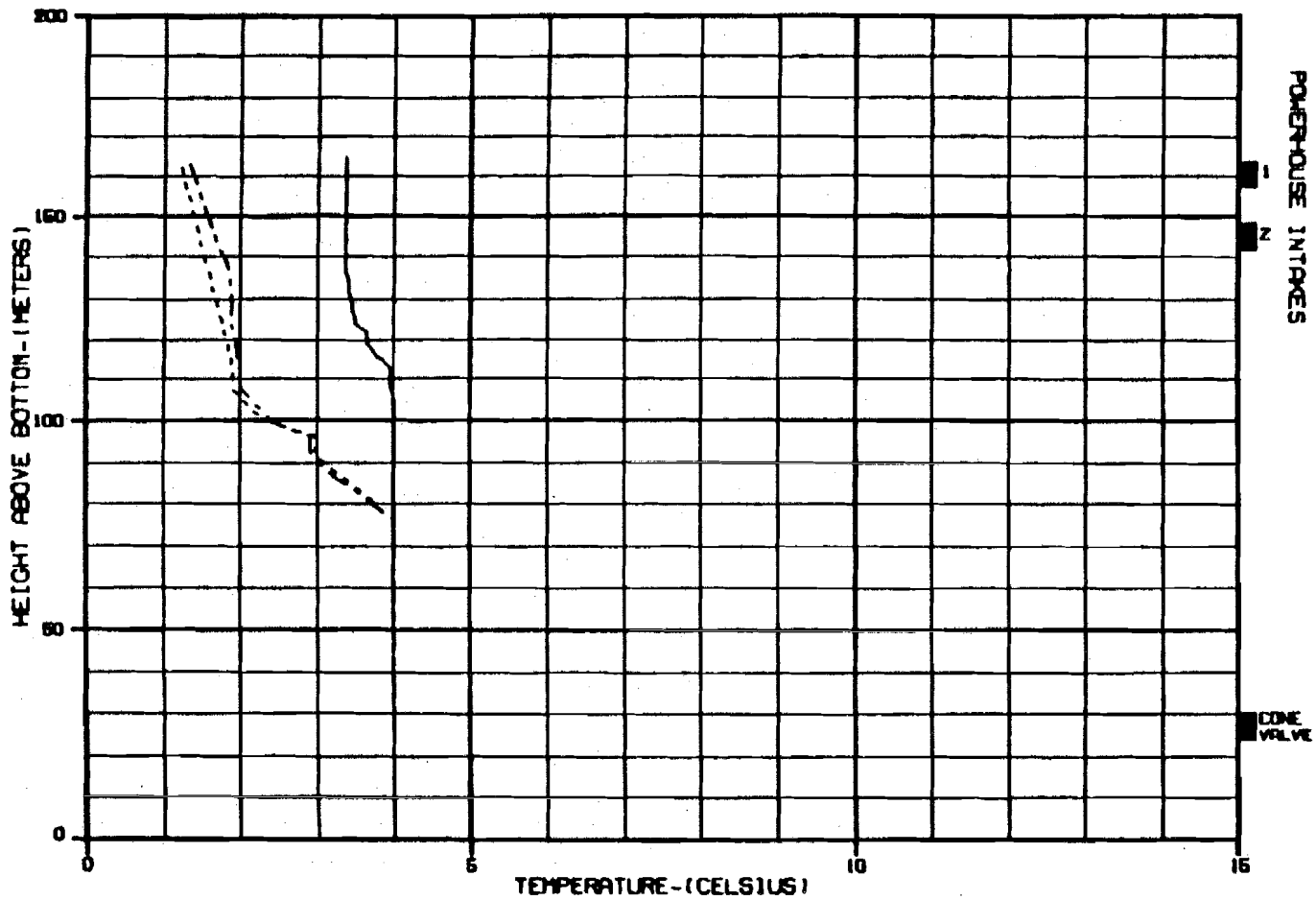
ALASKA POWER AUTHORITY

DEVELOPMENT PROJECT | OTHER MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRARD JOINT VENTURE

MODEL: 0-0-000 | 0 JAN 81 | 42-010-01



CASE: ■■ DC7402A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | NOVEMBER 1974
- | DECEMBER 1974
- · - · - · | JANUARY 1975

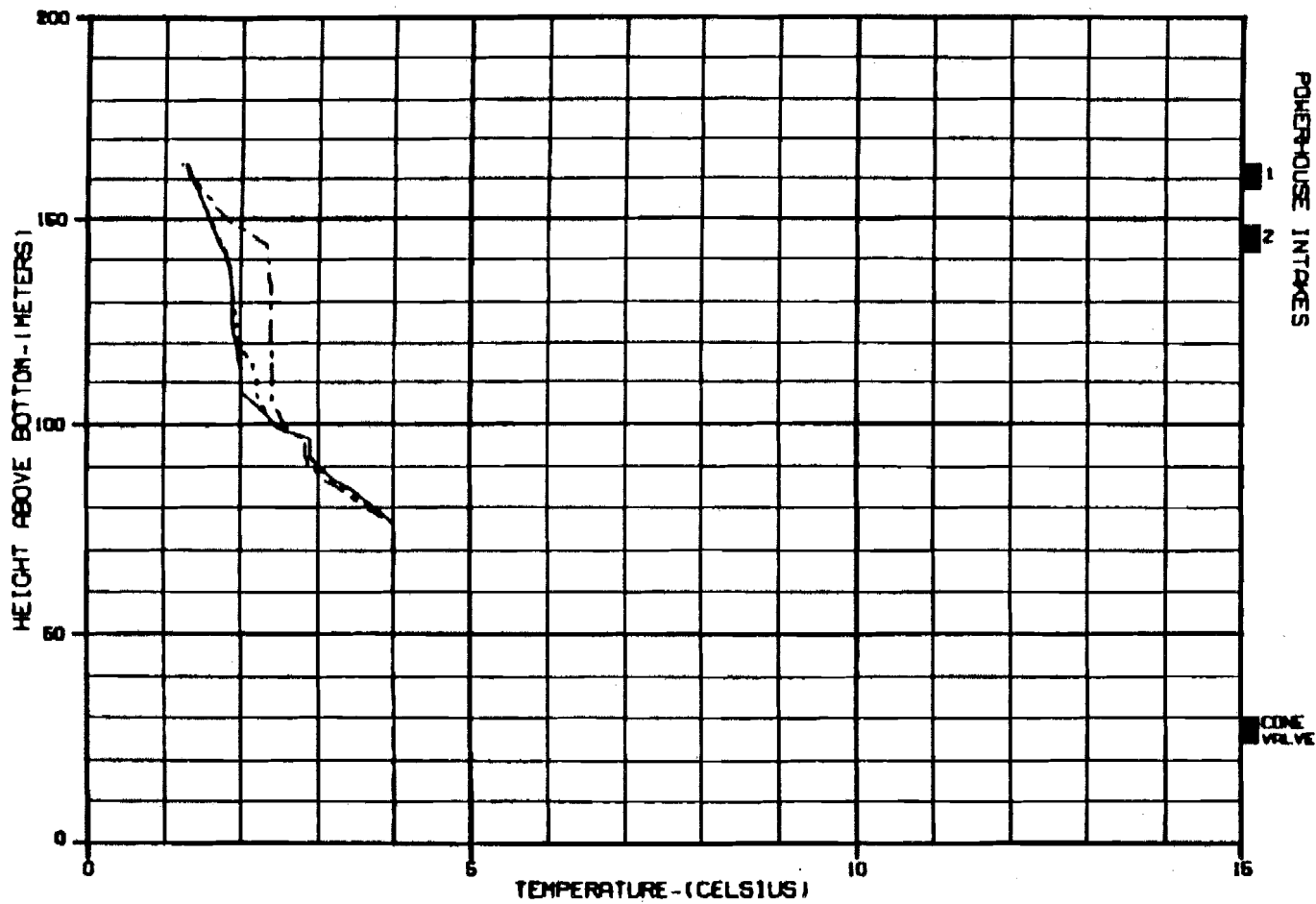
ALASKA POWER AUTHORITY

SUBMITTAL PROJECT DESIGN MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

WARZA-EBRISCO JOINT VENTURE

DESIGNED: B.L. BROWN 8 JAN 84 42-010-04



CASE: ■■ DC7402A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— 1 FEBRUARY 1975
 - - - - 1 MARCH 1975
 - · - · 1 APRIL 1975

ALASKA POWER AUTHORITY

EXISTING PROJECT

OPENING MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

WARZA-EBRACCO JOINT VENTURE

CHANGES: 01-0000

0 JAN 84

01-010-01

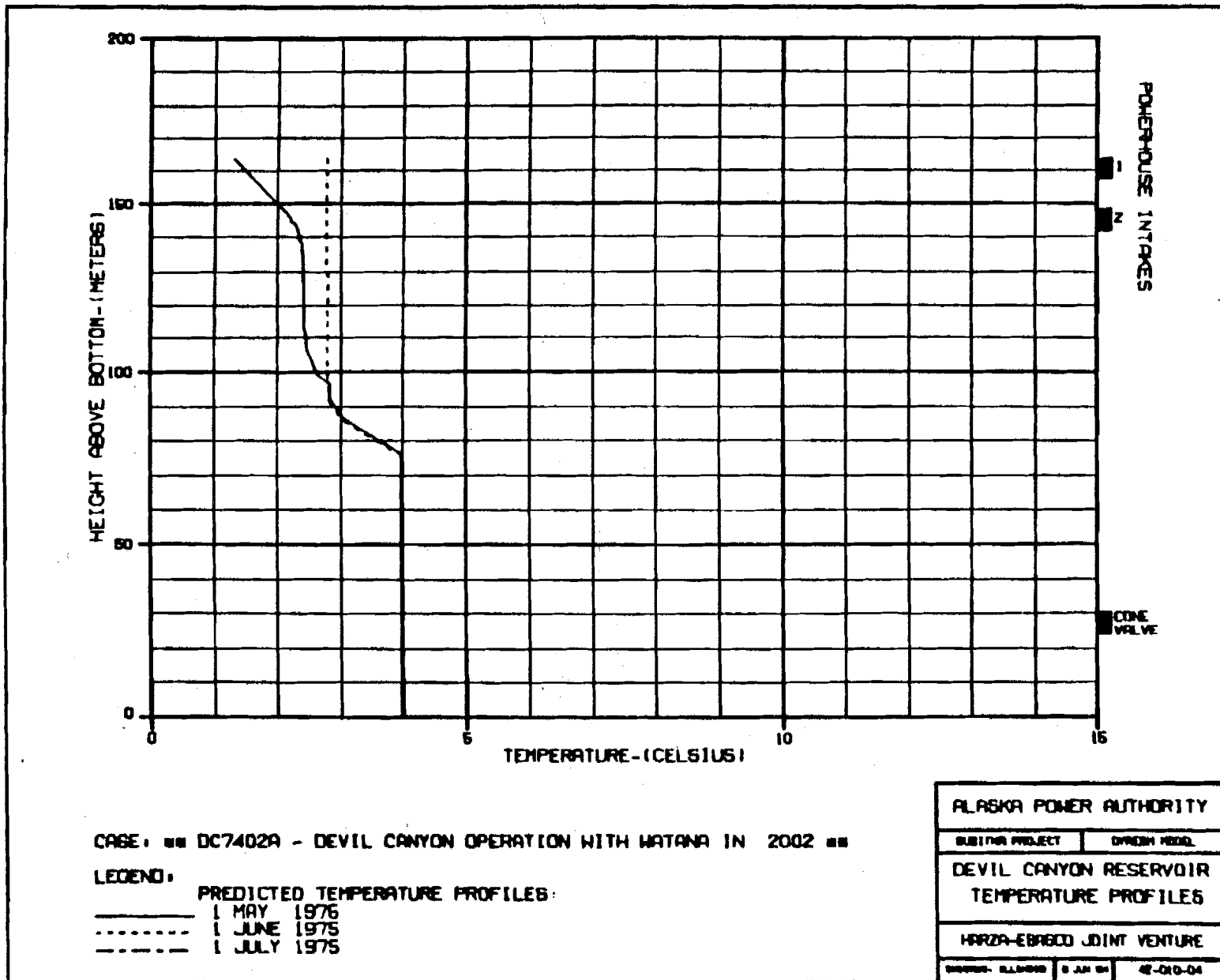
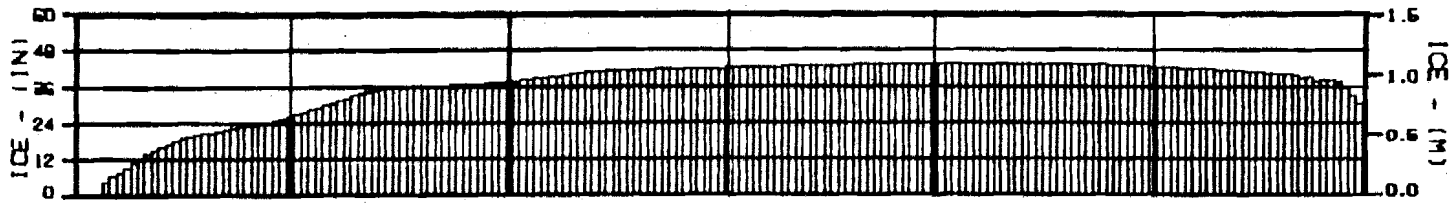
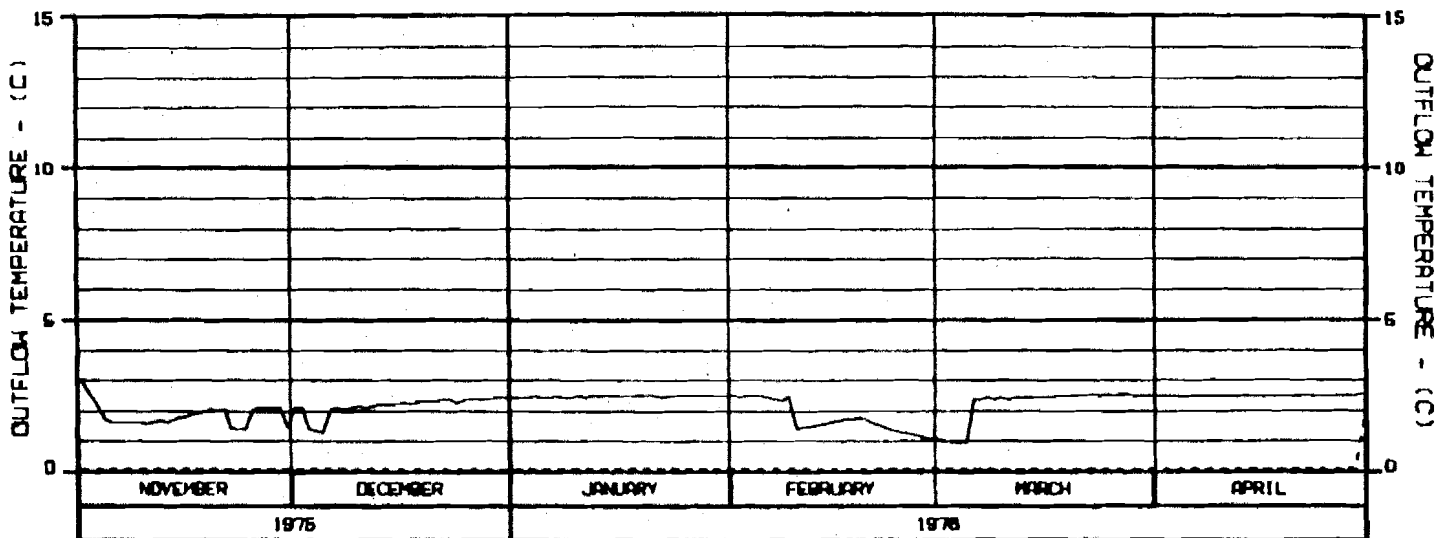


EXHIBIT AL



INTAKE	LEVEL 1					
	LEVEL 2					



LEGEND: CASE: ■ DC7602A - DEVIL CANYON OPERATION WITH MATANA IN 2002 ■

— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.84 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1376 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.76 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

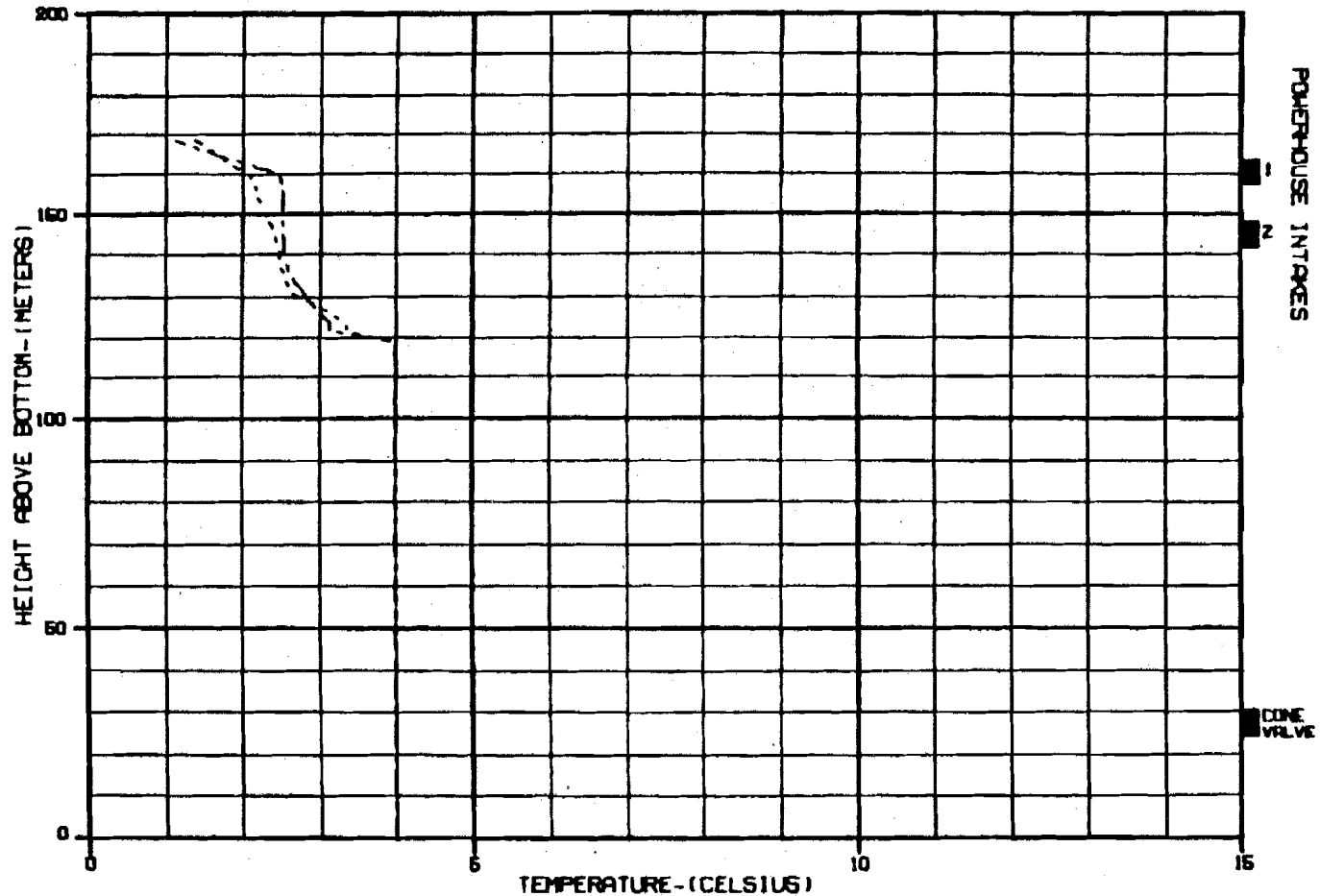
ALASKA POWER AUTHORITY

BUILDING PROJECT DIVISION MODEL

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

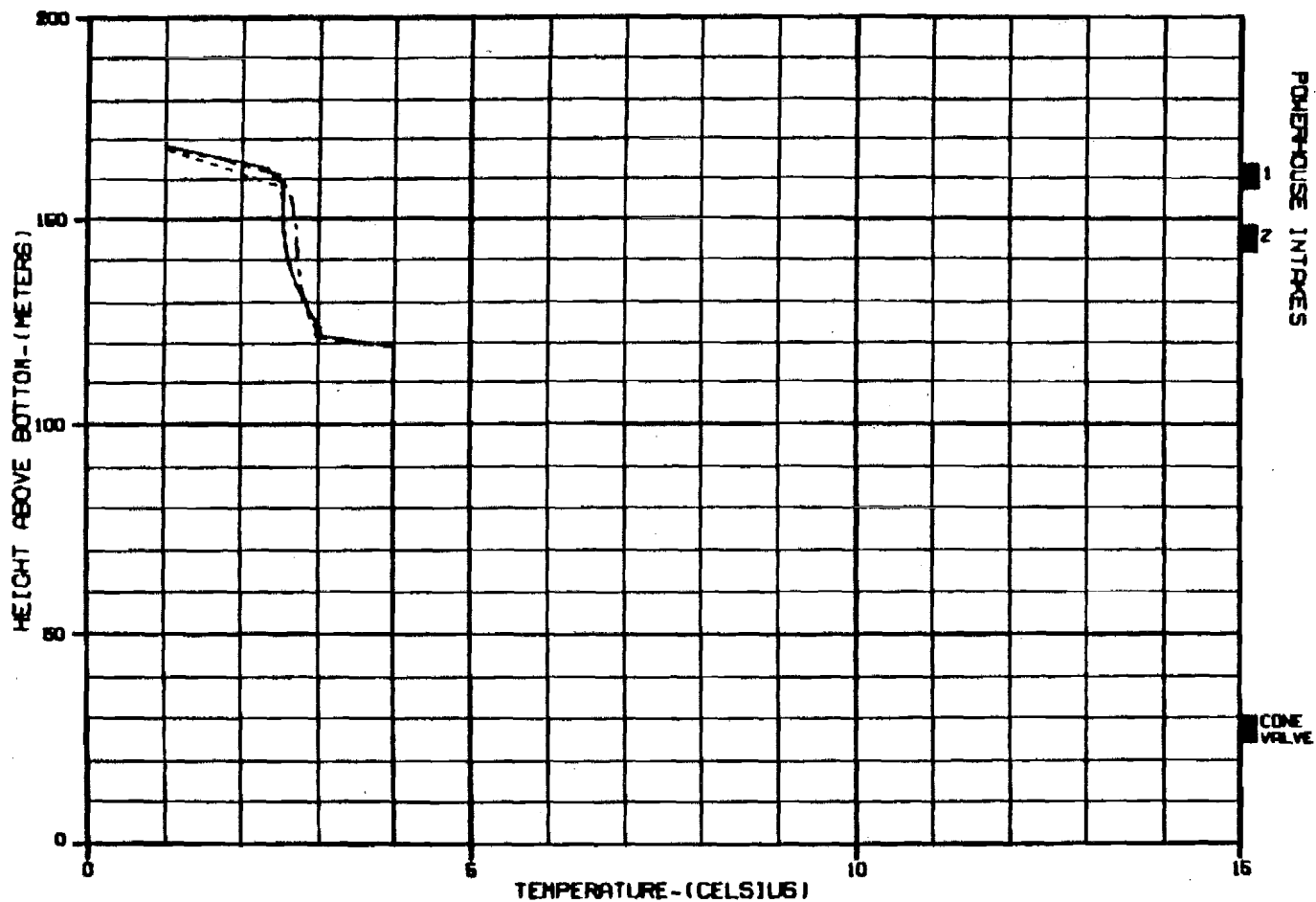
DATE: 11/19/80 9 JAN 81 REV: 1 OF 1



CASE: ■■ DC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1976
 - - - - - | DECEMBER 1976
 - · - · - | JANUARY 1976

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	OPERATION RECORD	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBRACCO JOINT VENTURE		
FORM NO. ELP-000	8 JAN 94	42-010-04



CASE: ■■ DC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ 1 FEBRUARY 1976
 1 MARCH 1976
 - - - - - 1 APRIL 1976

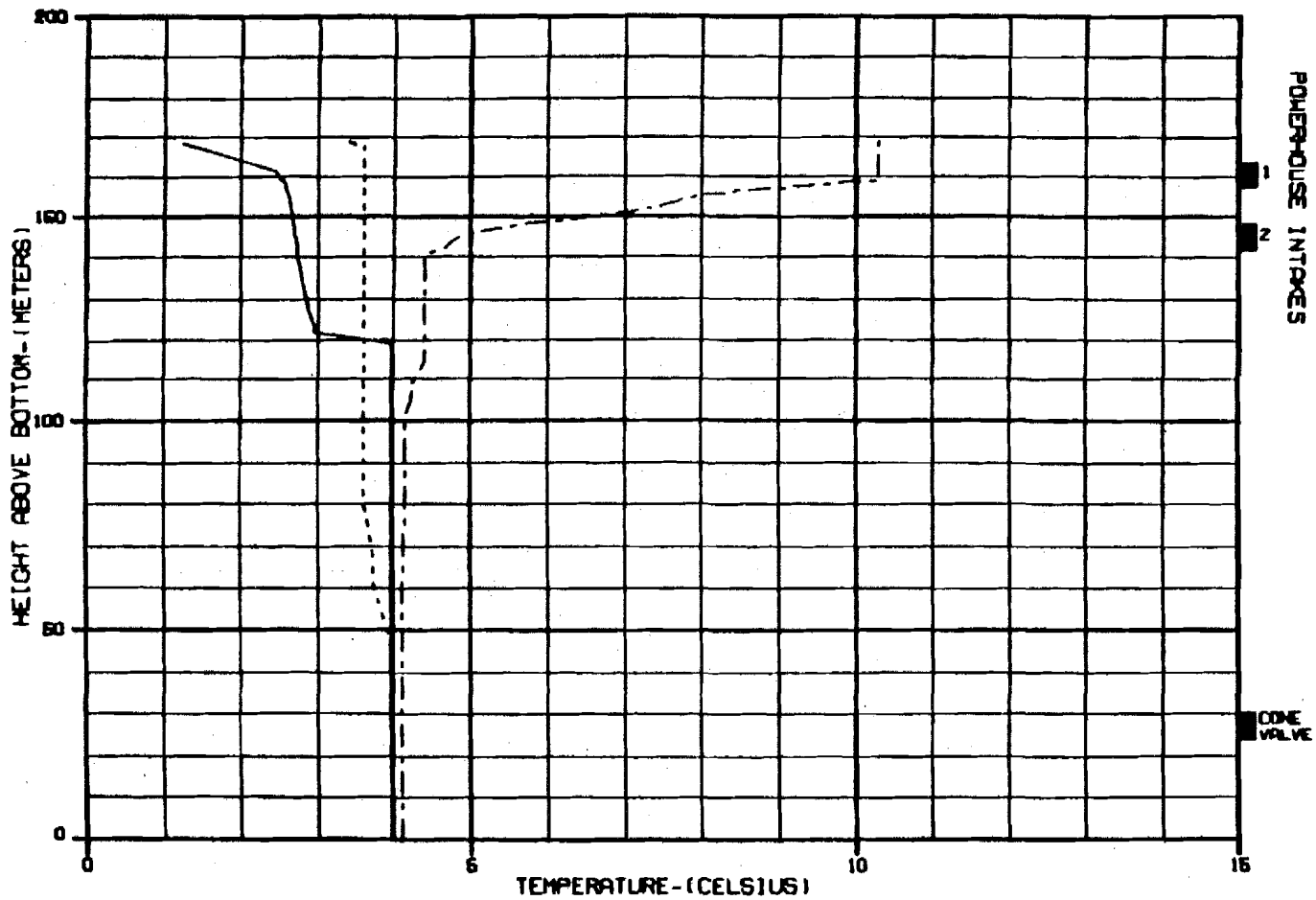
ALASKA POWER AUTHORITY

SUBMITTER PROJECT DRAWING NO.

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DRAWING NUMBER DATE 42-010-04



CASE: ■■■ DC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- MAY 1976
- - - JUNE 1976
- · - · JULY 1976

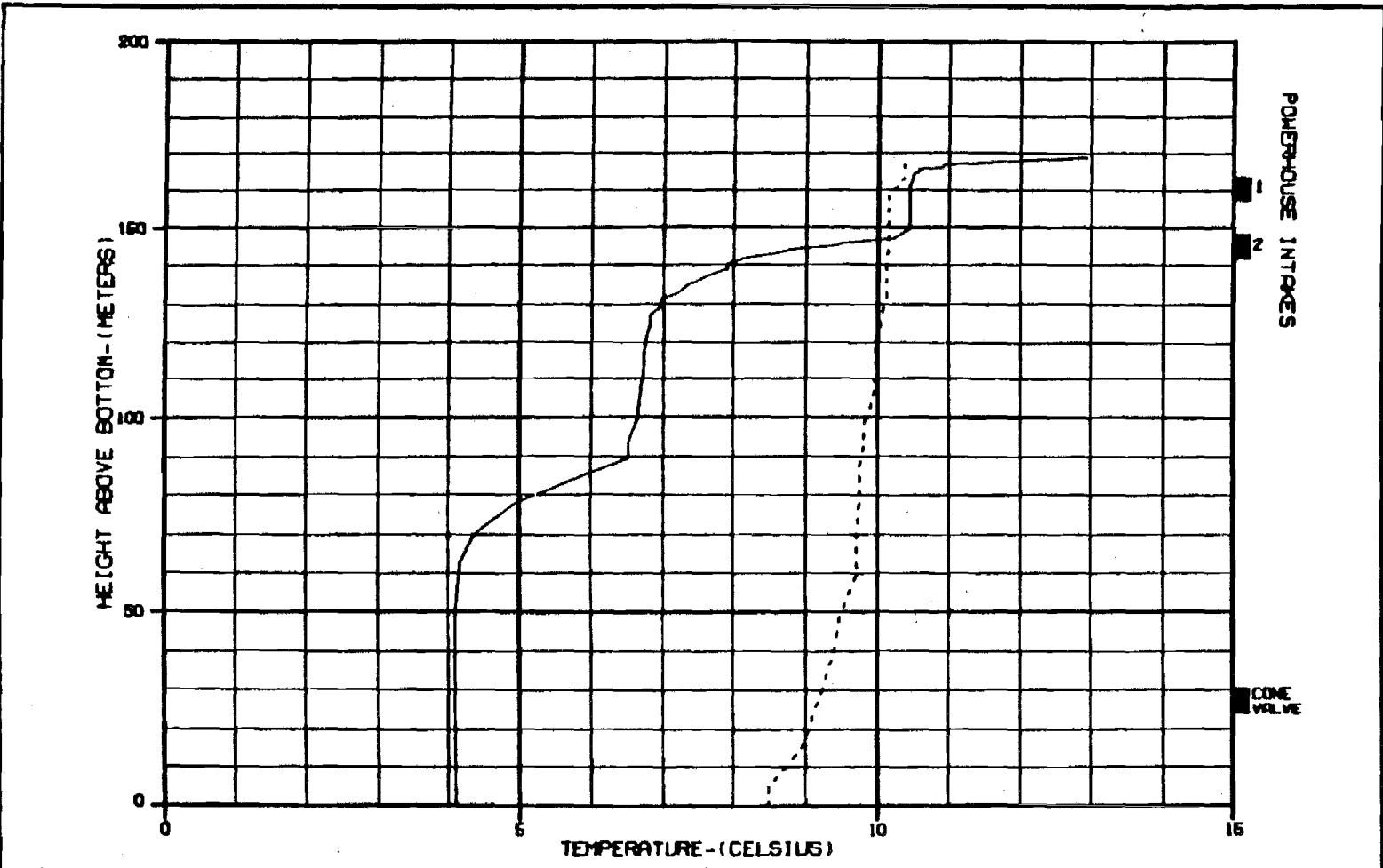
ALASKA POWER AUTHORITY

DEVELOPER PROJECT | OPERATOR MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGNER: B.L. BROWN | DRAWN BY: B.A.M. 84 | 42-010-04



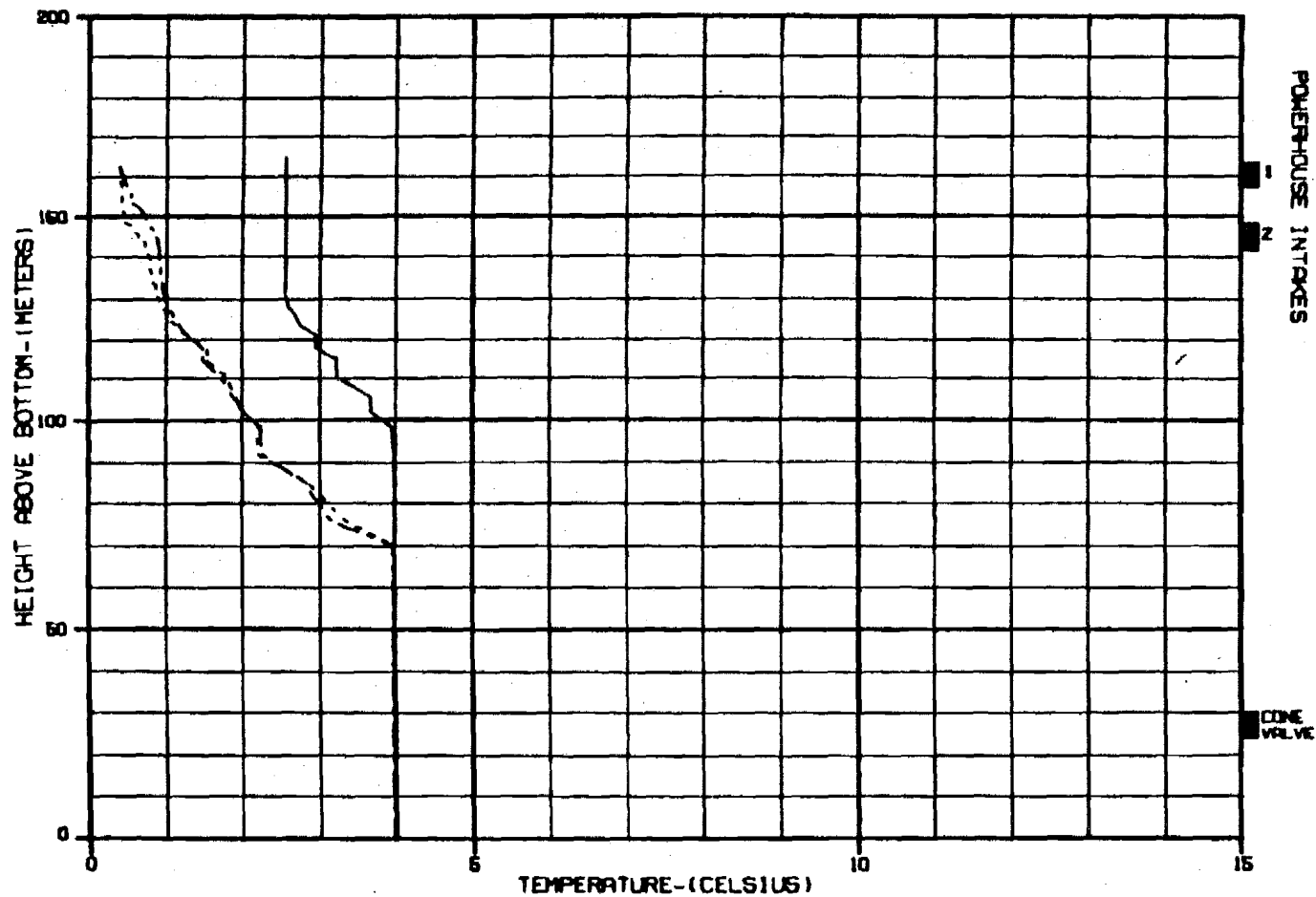
CASE: ■■ DC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 AUGUST 1976
- 1 SEPTEMBER 1976
- 1 OCTOBER 1976

ALASKA POWER AUTHORITY		
OWNER PROJECT	OPERATION MODEL	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
ISSUED: 01.19.00	8 JAN 01	42-D10-04



CASE: ■■ DC7802A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | NOVEMBER 1976
 - - - | DECEMBER 1976
 - · - · | JANUARY 1977

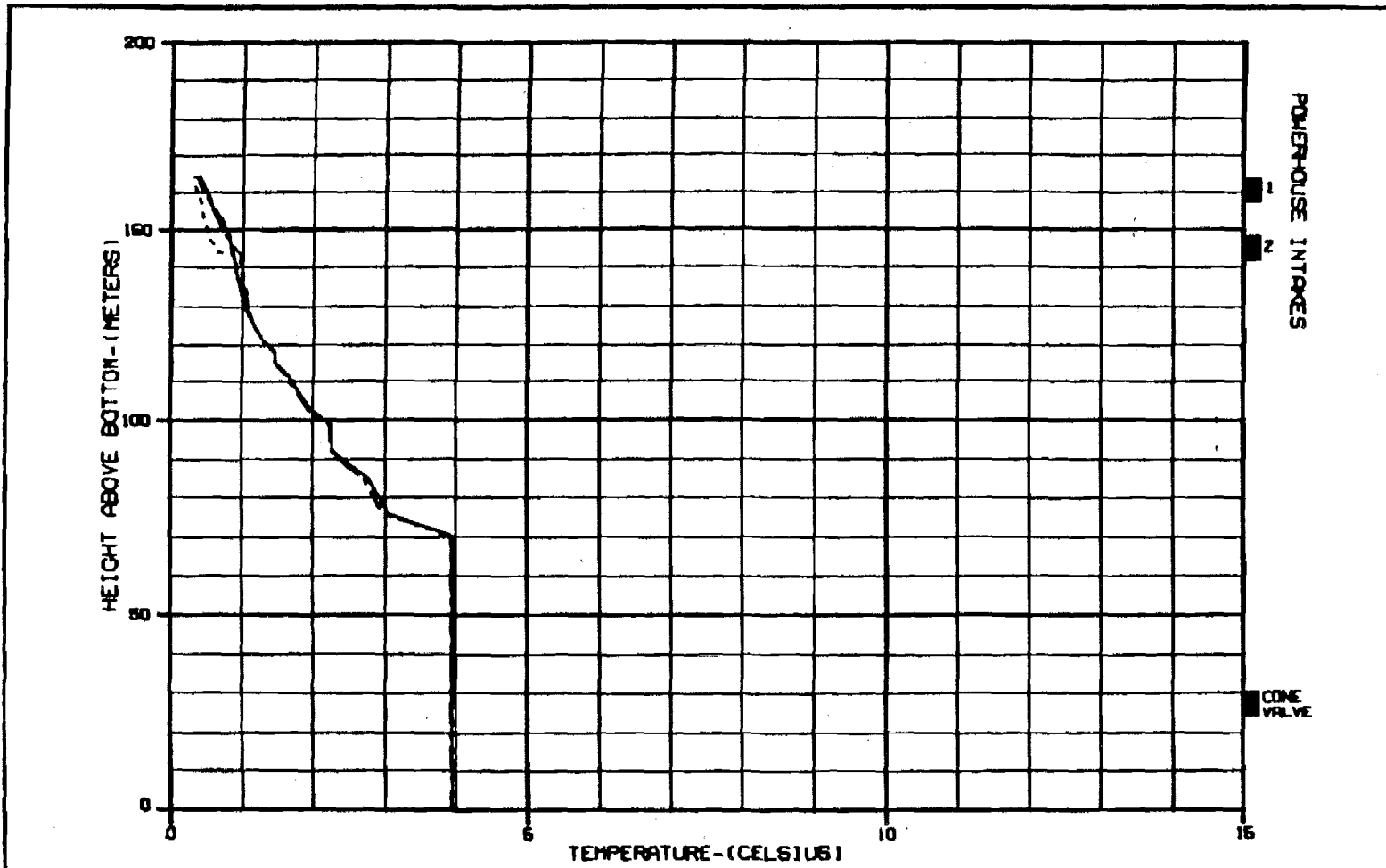
ALASKA POWER AUTHORITY

DEVELOPER PROJECT OPERATOR

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

WARZA-EBRSCO JOINT VENTURE

DESIGNED BY: J.P. 8 JAN 84 42-010-04



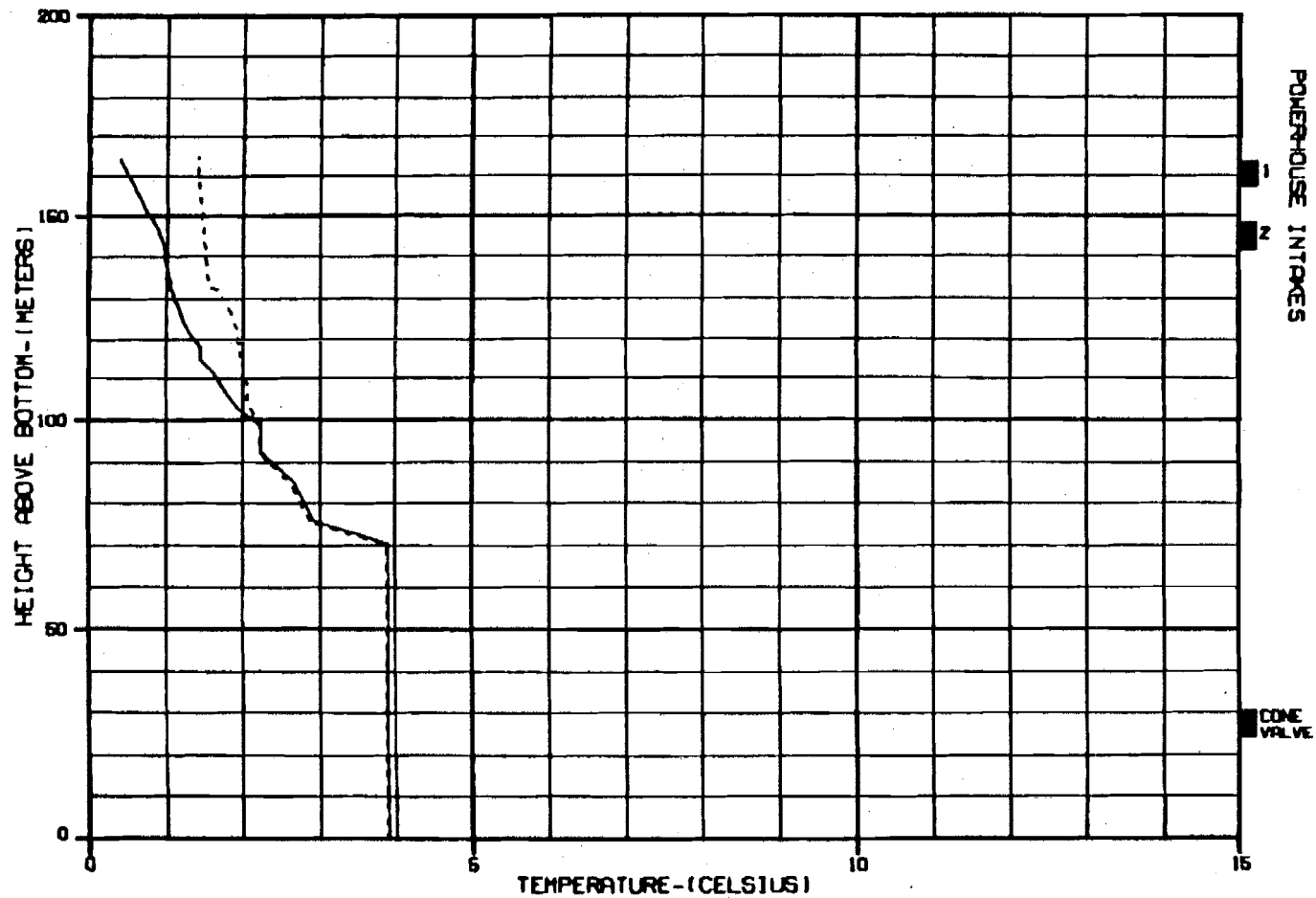
CASE: ■■ DC7602A - DEVIL CANYON OPERATION WITH MATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- FEBRUARY 1977
- MARCH 1977
- APRIL 1977

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	DIVISION MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
UNIVERS. ALASKA	42-010-04



CASE: ■■ DC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- MAY 1977
- - - JUNE 1977
- · - · JULY 1977

ALASKA POWER AUTHORITY

SUBMITTER PROJECT

OPERATION MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

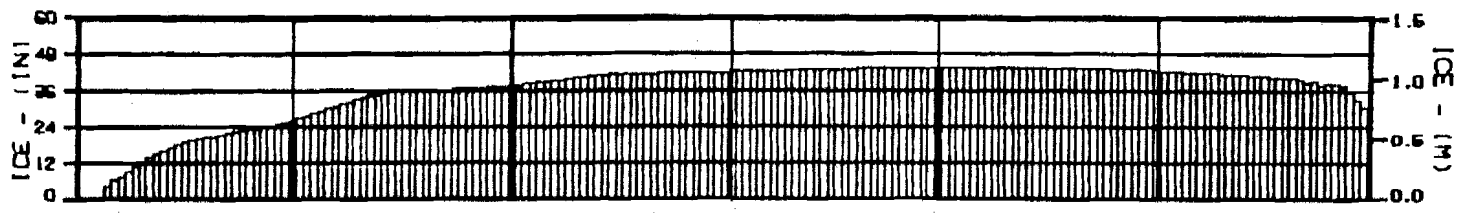
WARZA-EBRACCO JOINT VENTURE

DISPENSER: 01.0000

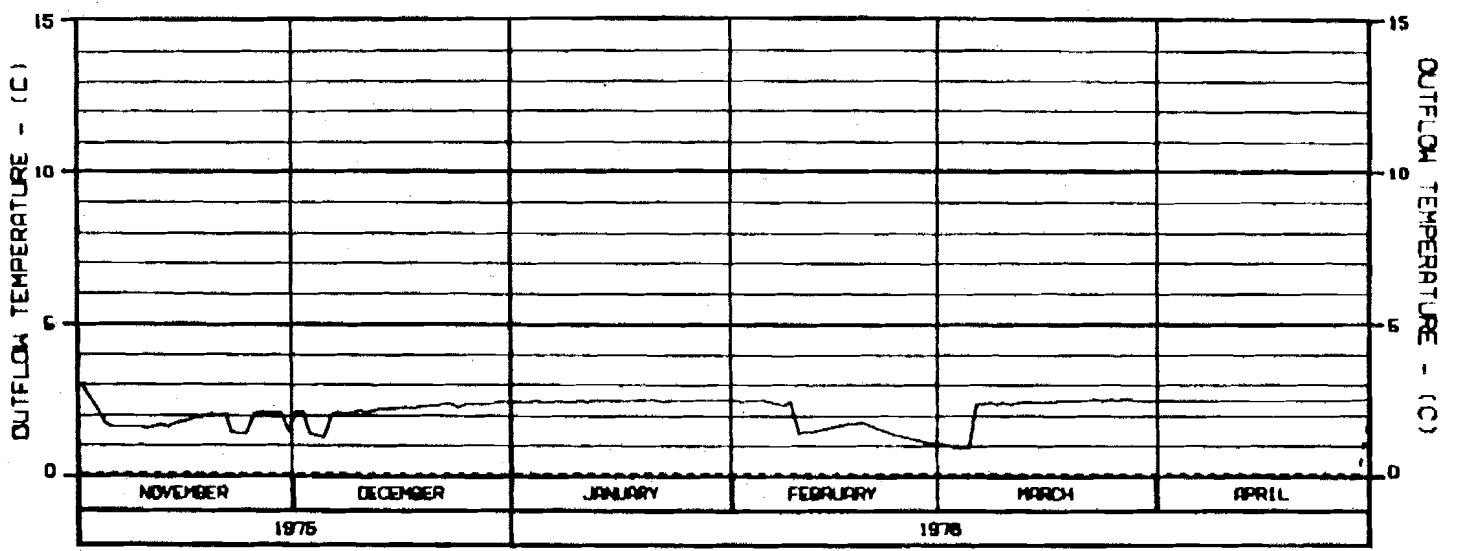
0 JUN 84

48-010-04

EXHIBIT AL



INTAKE	LEVEL 1				
	LEVEL 2				
CONE VALVE					
SPILLWAY					

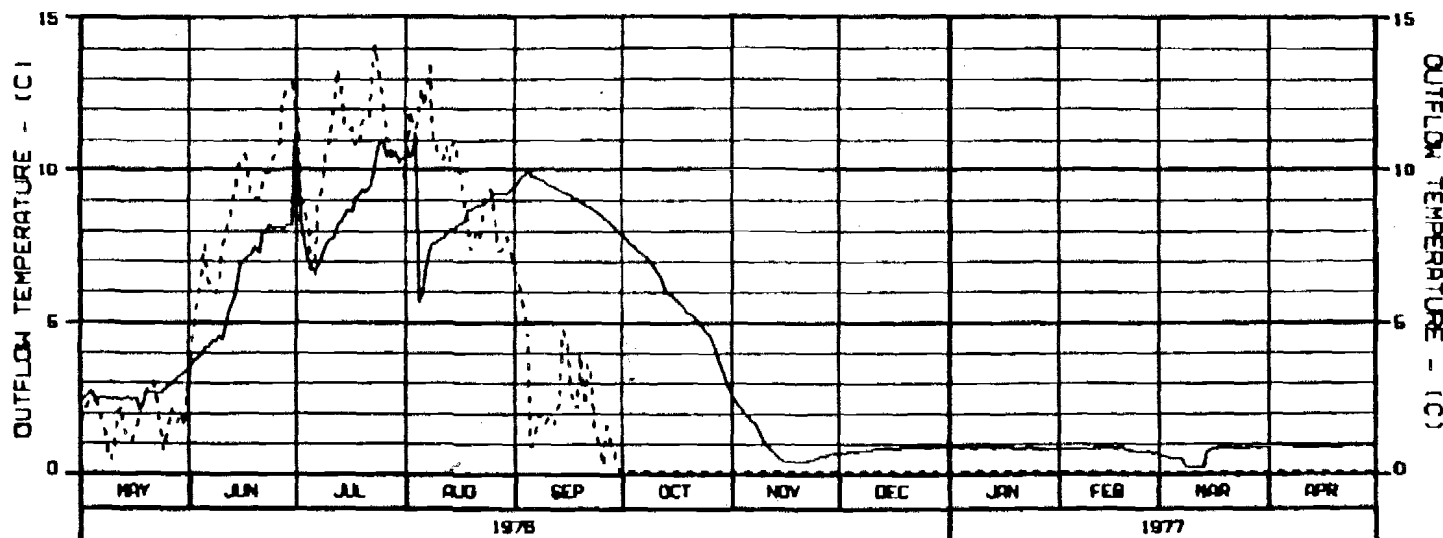
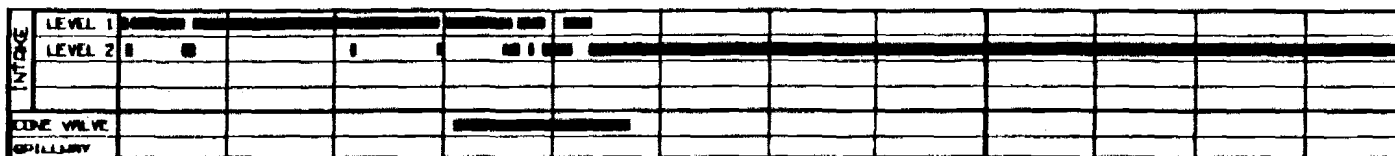
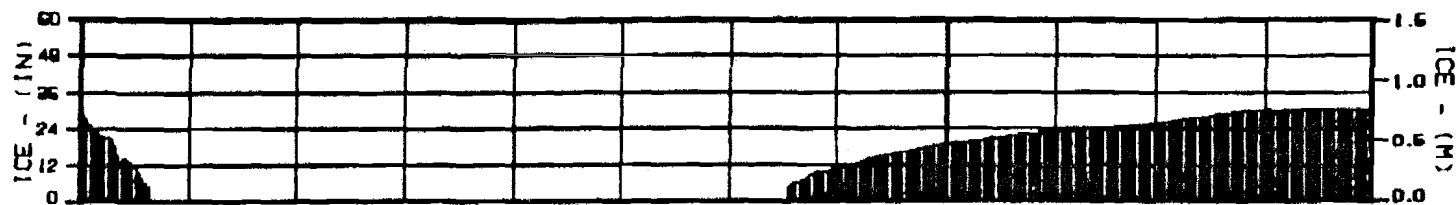


LEGEND: CASE: DC7602A - DEVIL CANYON OPERATION WITH MATANA IN 2002

———— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.24 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1276 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	DYNAMIC MODEL
DEVIL CANYON RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH	
WARZA-EBASCO JOINT VENTURE	
DATE: 11/19/80	BY: JJA/BA
NO. 147-48-010-04	



LEGEND: CASE: DC7602A - DEVIL CANYON OPERATION WITH MATANA IN 2002

— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.84 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1376 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 980 FT (299.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.84 M)

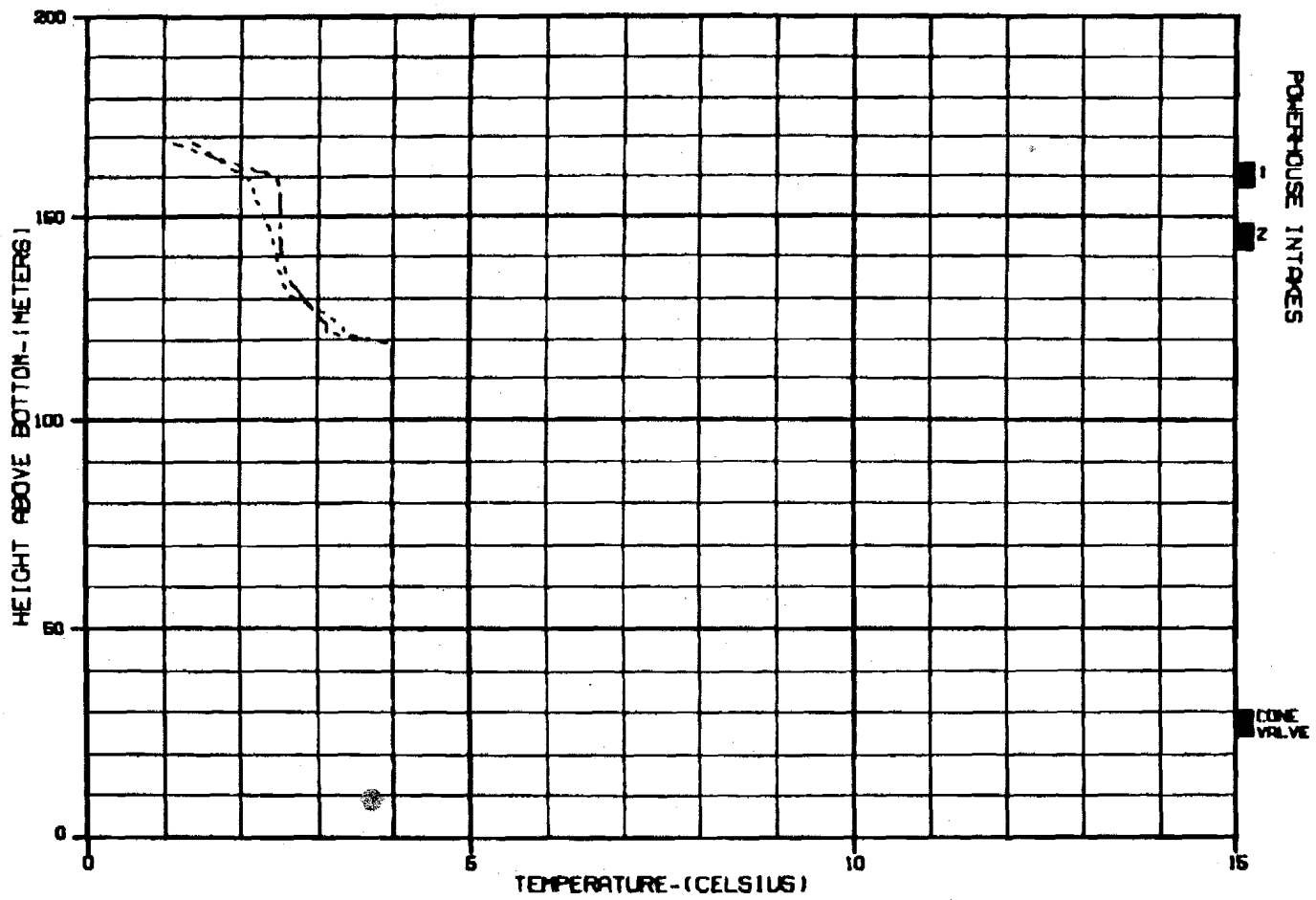
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DIVISION MODEL

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DATE: 11/19/88 8 AM BY: WML/LH/ALB/DA



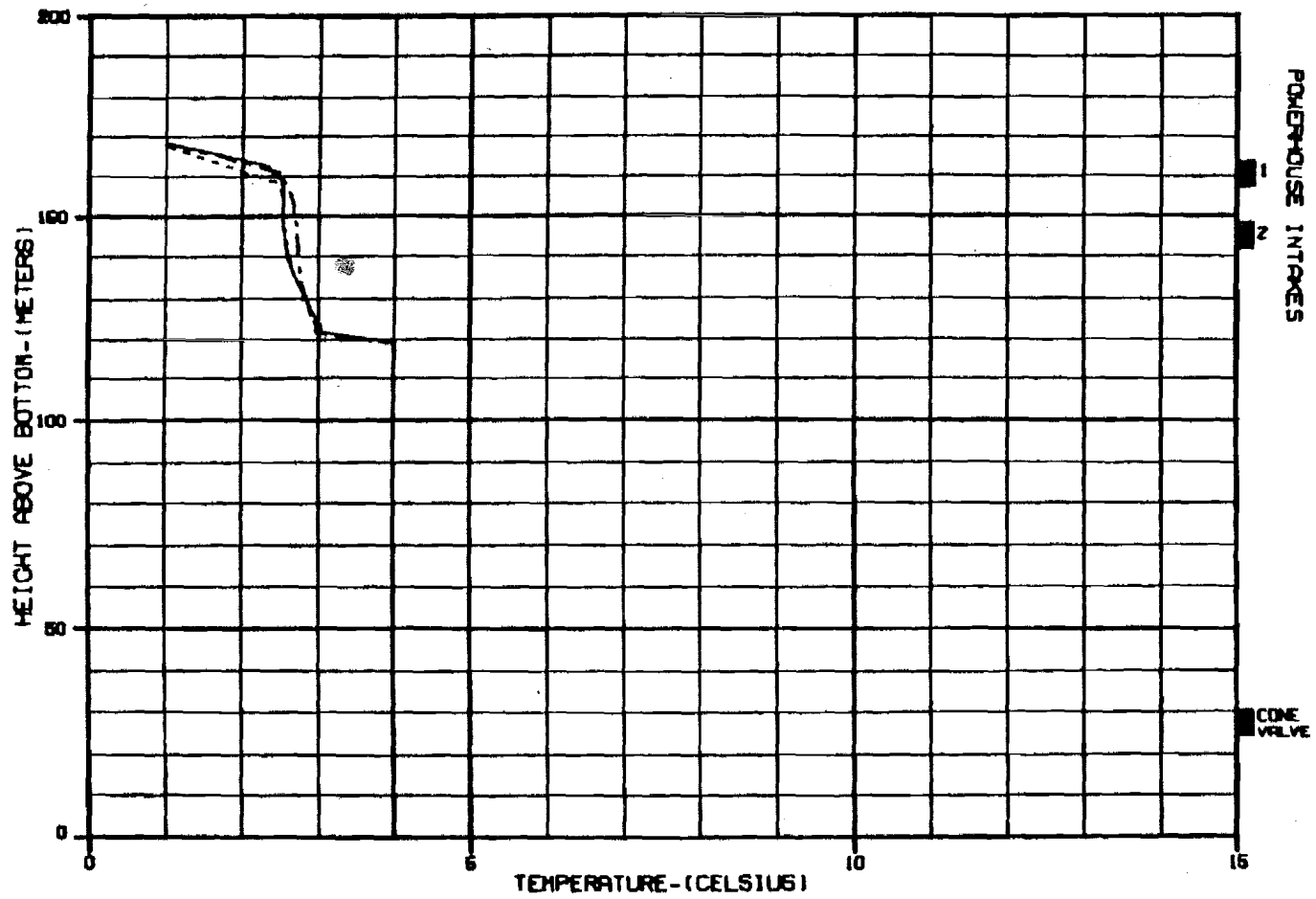
CASE: ■■ DC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | NOVEMBER 1976
- | DECEMBER 1976
- | JANUARY 1976

ALASKA POWER AUTHORITY		
SUBMITTER PROJECT	DIVISION MODEL	
DEVIL CANYON RESERVOIR		
TEMPERATURE PROFILES		
WARZA-EBRISCO JOINT VENTURE		
DESIGNED BY	DATE	42-010-04



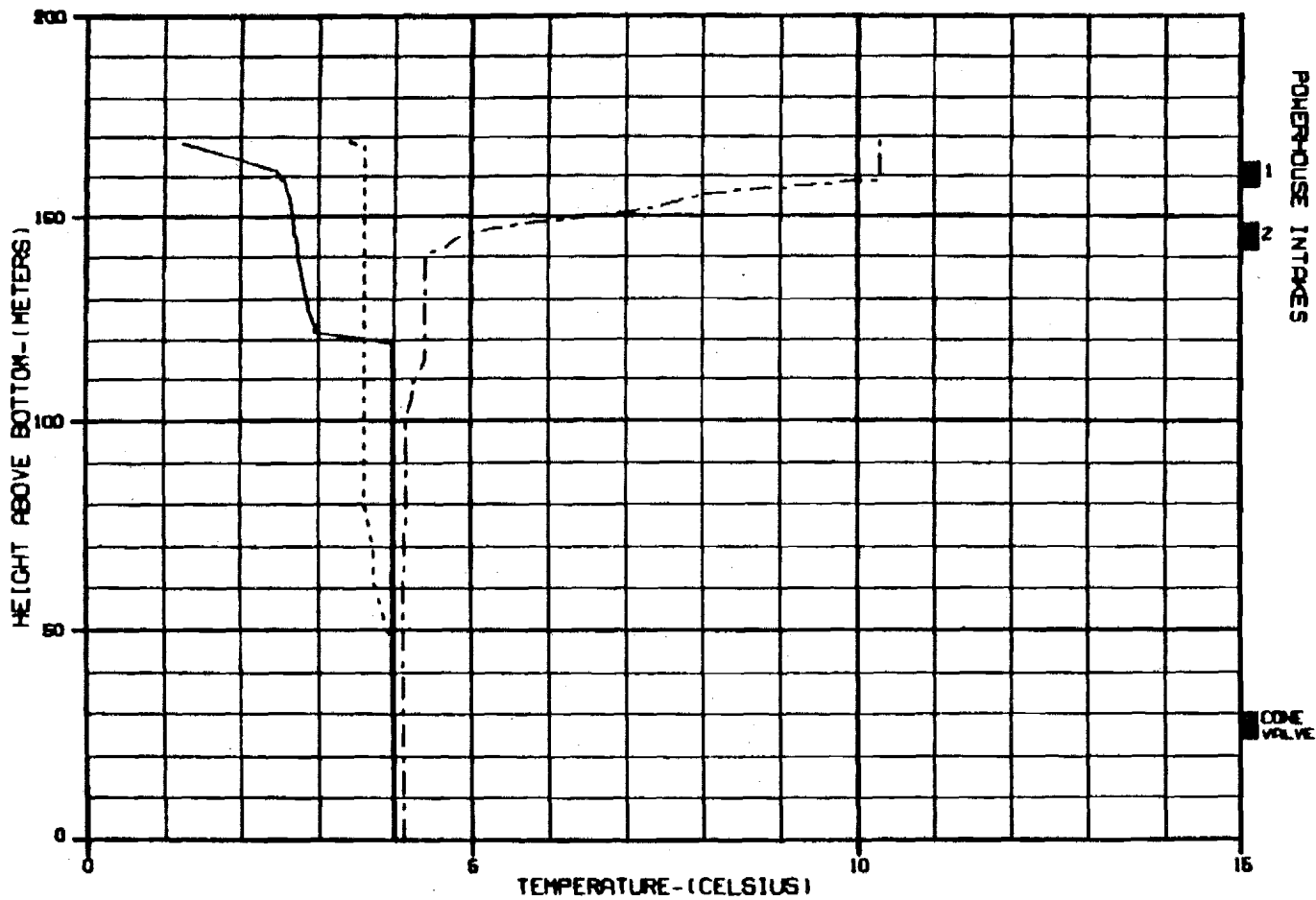
CASE: WDC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 W

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | FEBRUARY 1976
- - - | MARCH 1976
- · - · | APRIL 1976

ALASKA POWER AUTHORITY	
PLANT PROJECT	DIAGRAM MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
ISSUED: 11/10/76	42-010-04



CASE: ■■ DC7602A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

————— | MAY 1976
 - - - - - | JUNE 1976
 - · - · - | JULY 1976

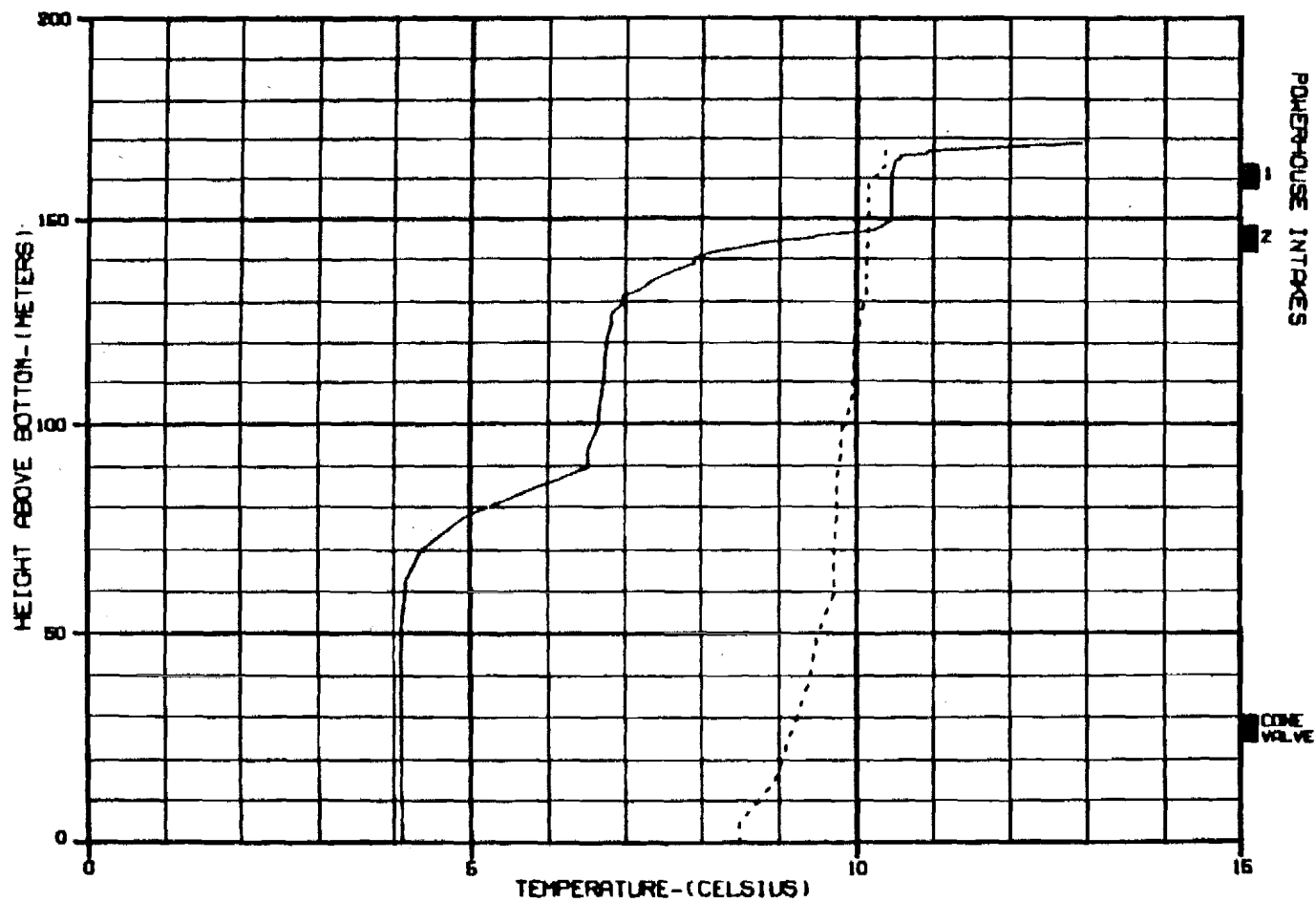
ALASKA POWER AUTHORITY

SUBMITTA PROJECT | DRAWING MODEL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EGRECO JOINT VENTURE

DESIGNER - E.L. BROWN | DRAWN BY - J.A. SMITH | DATE - 02-01-04



CASE: DC7602A - DEVIL CANYON OPERATION WITH HATANA IN 2002

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | AUGUST 1976
 | SEPTEMBER 1976
 - - - - - | OCTOBER 1978

ALASKA POWER AUTHORITY

SUBMITTER PROJECT

DRAWN FROM

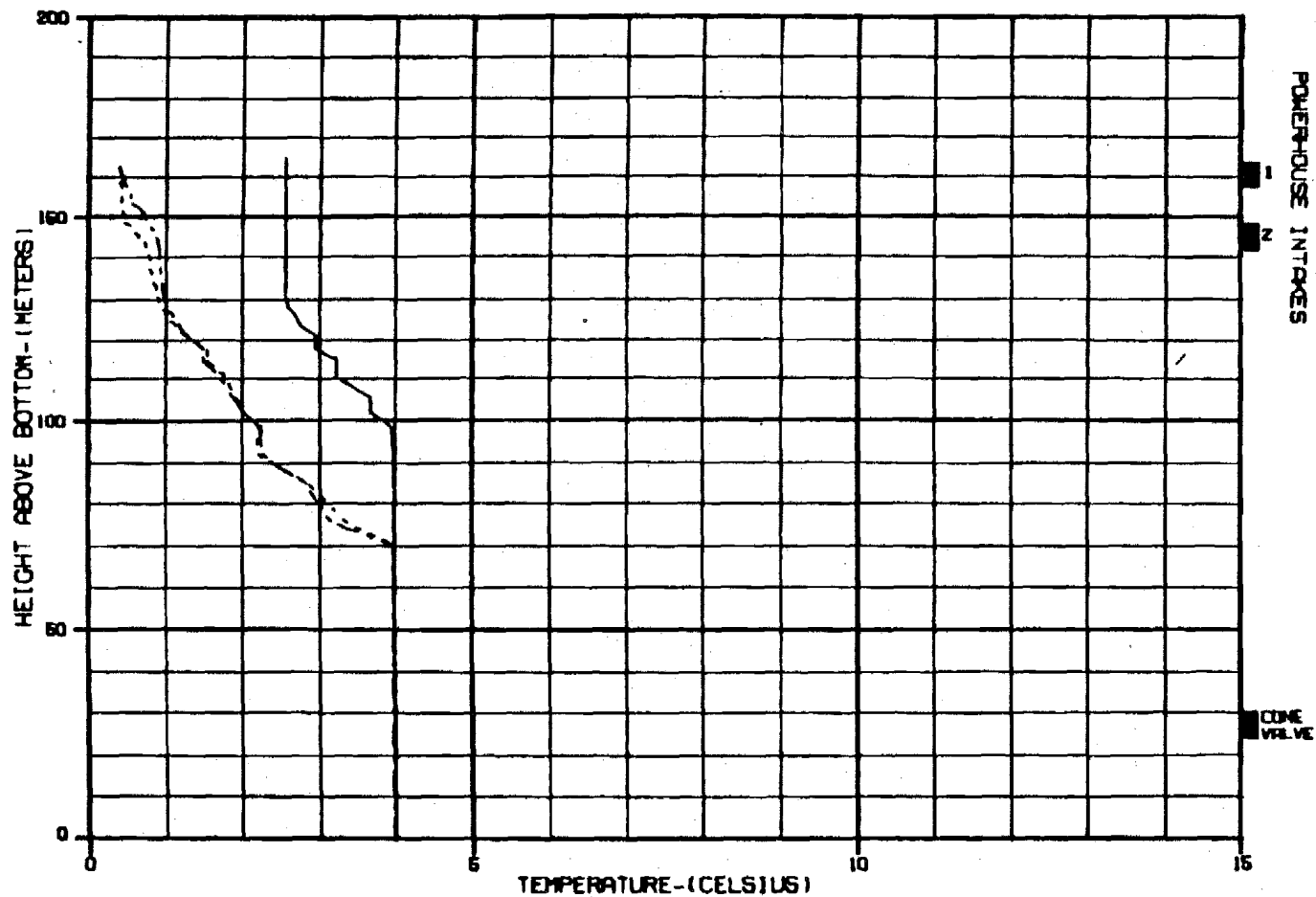
DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. PARR

DATE: JAN 84

42-010-04



CASE: ■■ DC7802A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 NOVEMBER 1976
 1 DECEMBER 1976
 - - - - 1 JANUARY 1977

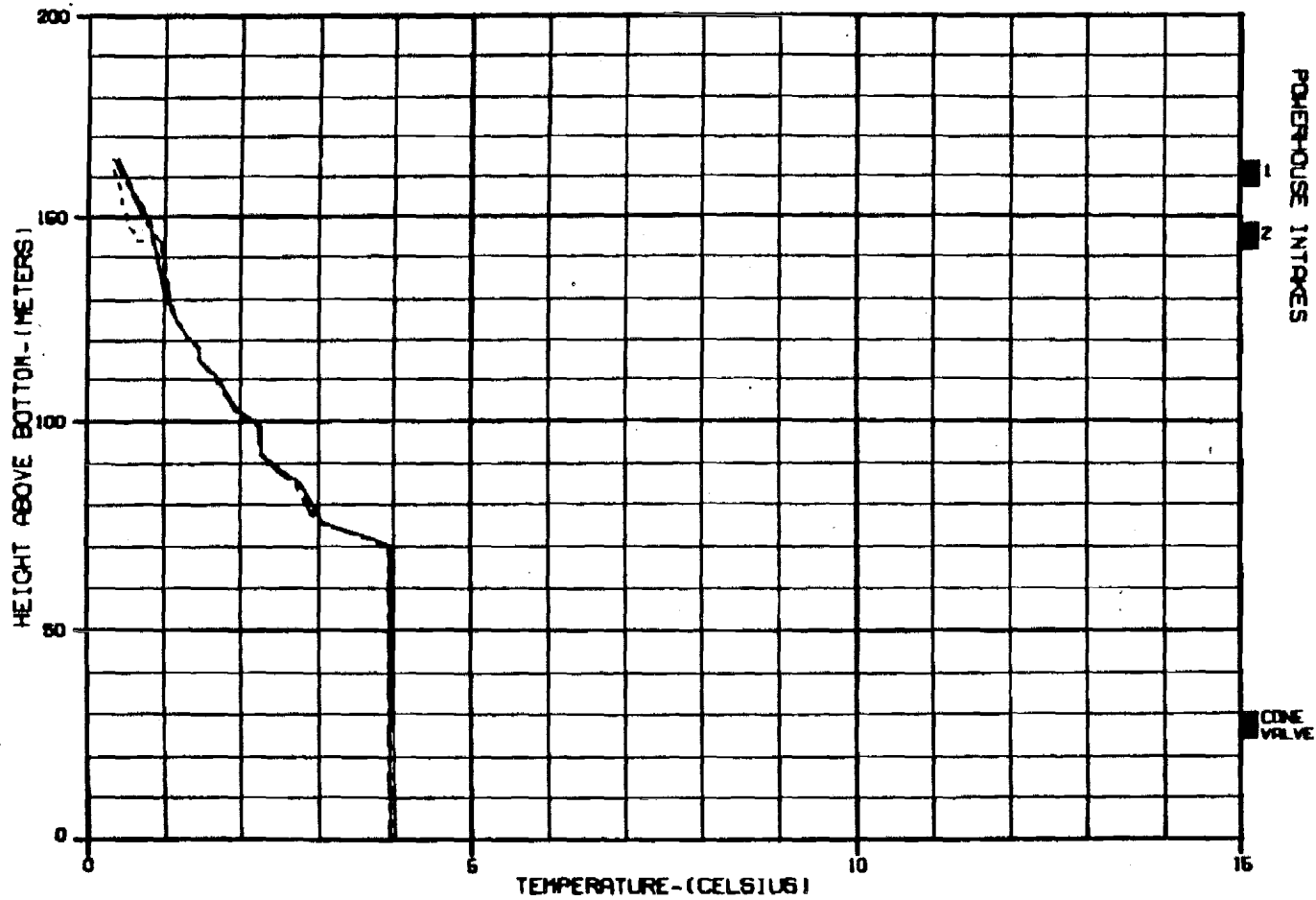
ALASKA POWER AUTHORITY

QUIETNA PROJECT | OPENING NEEDLE

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBRACCO JOINT VENTURE

DATE: 11/19/88 8 JAN 89 4-018-04



CASE: ■■ DC7802A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | FEBRUARY 1977
- - - | MARCH 1977
- · - · | APRIL 1977

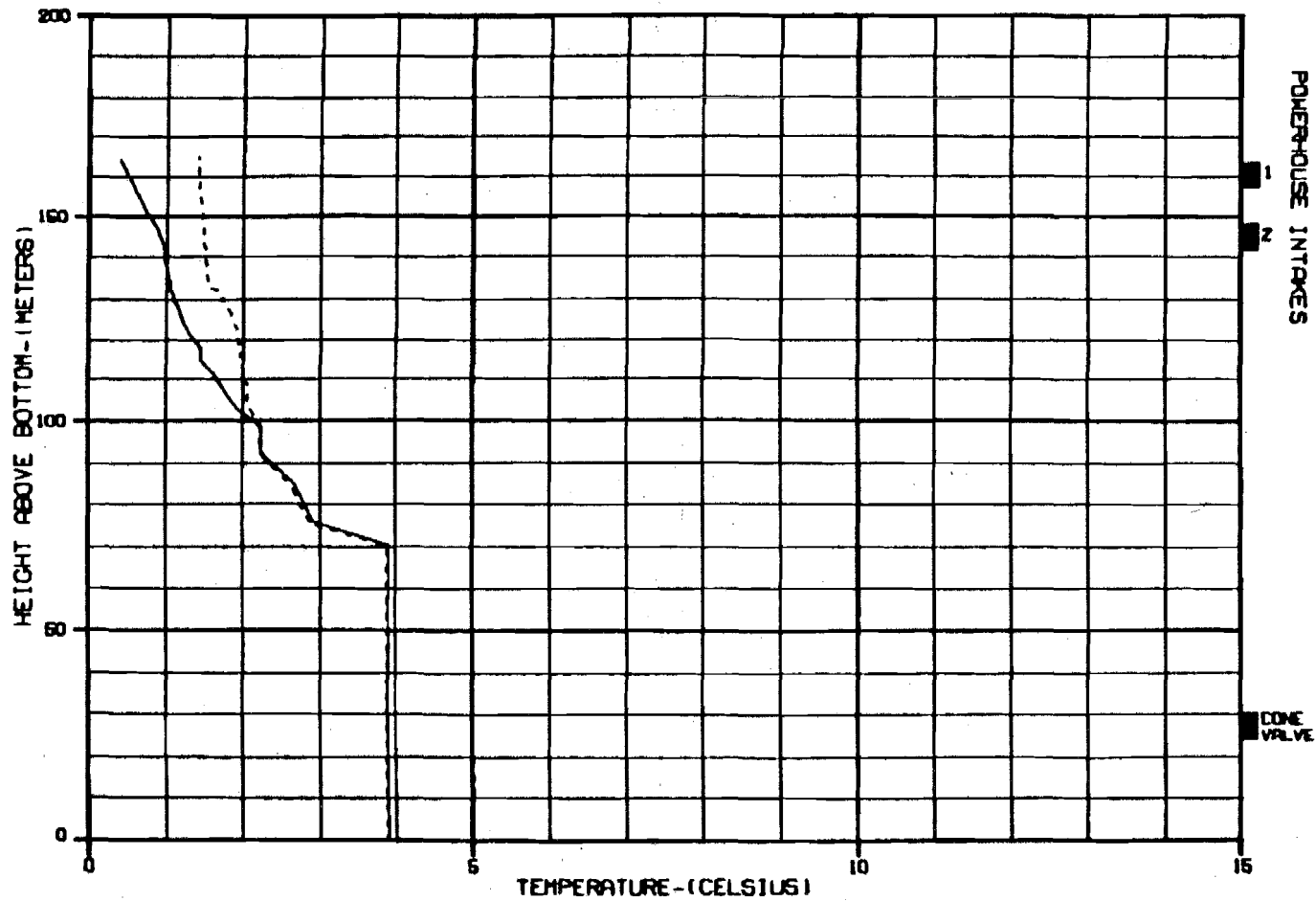
ALASKA POWER AUTHORITY

EXISTING PROJECT | OPENING MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGNED: S.L. PERRY | 8 JAN 84 | 42-010-04



CASE: ■■ DC7802A - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | MAY 1977
 - - - | JUNE 1977
 ····· | JULY 1977

ALASKA POWER AUTHORITY

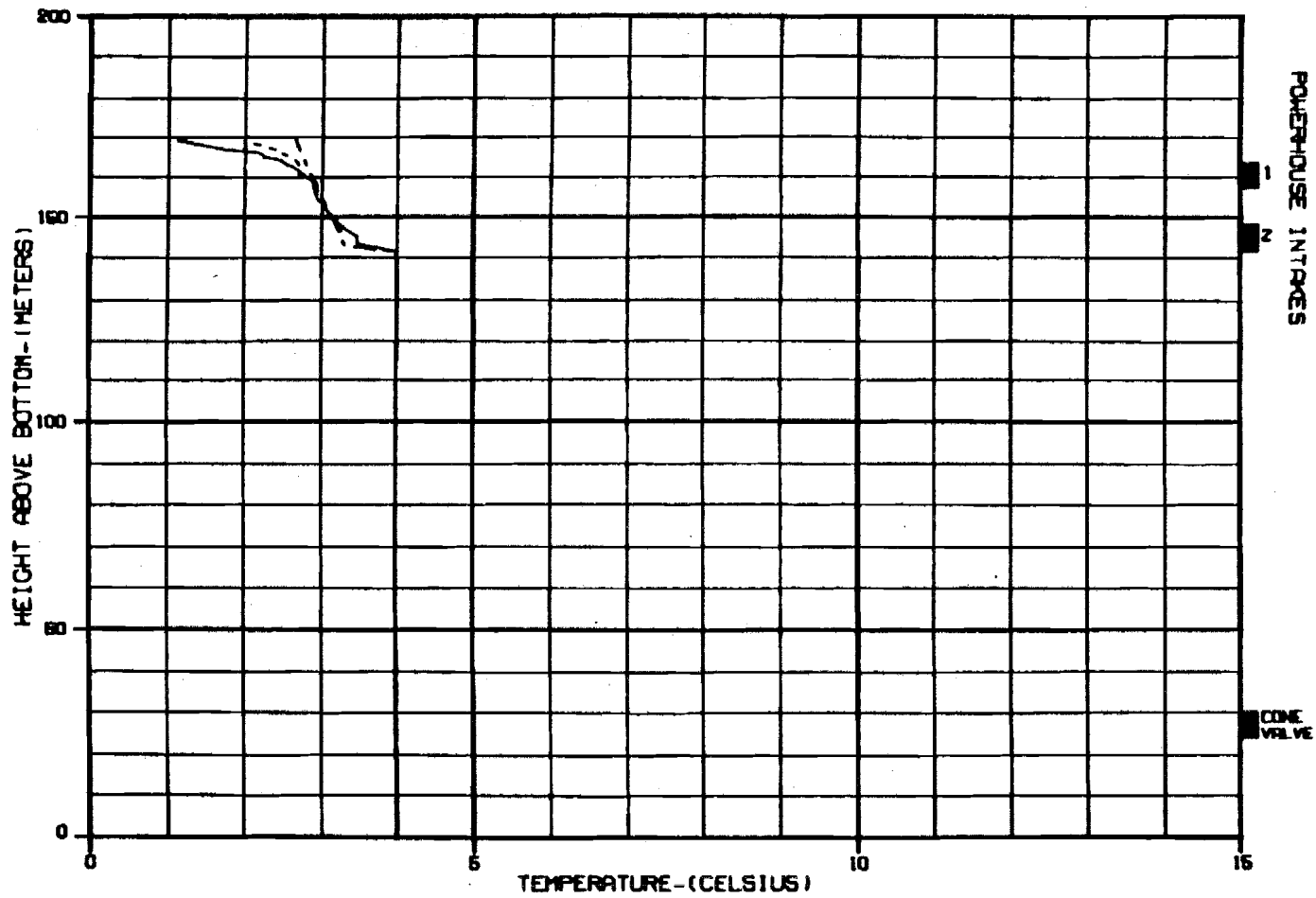
SUBMITTA PROJECT | OPERA PROJ.

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

ENCLOS. 51.0000 | 8 JAN 84 | 42-010-04

EXHIBIT AM



CASE: ■■ DCB1182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | FEBRUARY 1982
- - - | MARCH 1982
- · - · | APRIL 1982

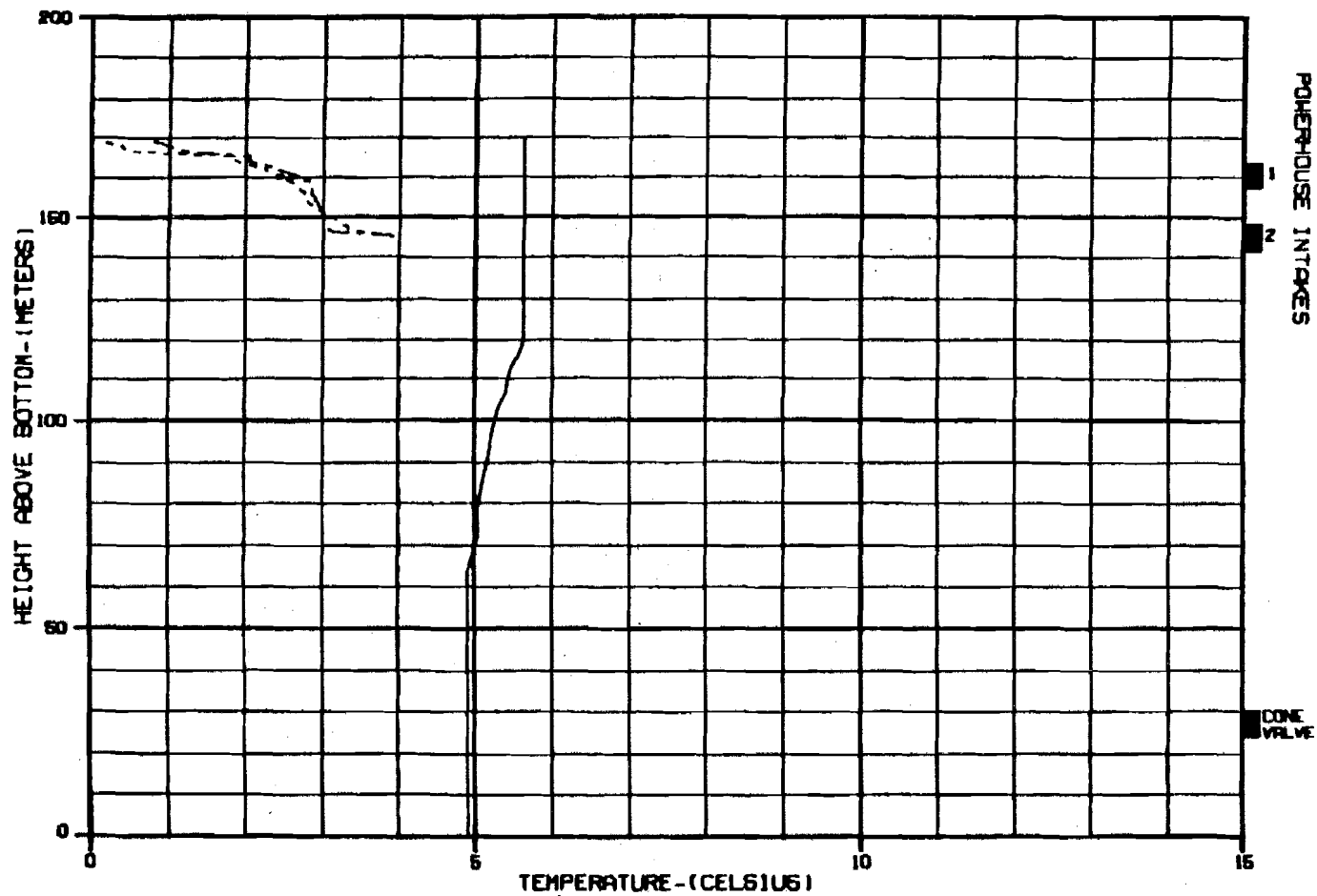
ALASKA POWER AUTHORITY

GUSTINA PROJECT | DAMON HEDL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBRSCO JOINT VENTURE

DESIGN: 811000 | 7 JAN 84 | 42-010-04



CASE: WDCB1182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1981
- - - 1 DECEMBER 1981
- · · 1 JANUARY 1982

ALASKA POWER AUTHORITY

DISTRIBUTION PROJECT

OPERATION MANUAL

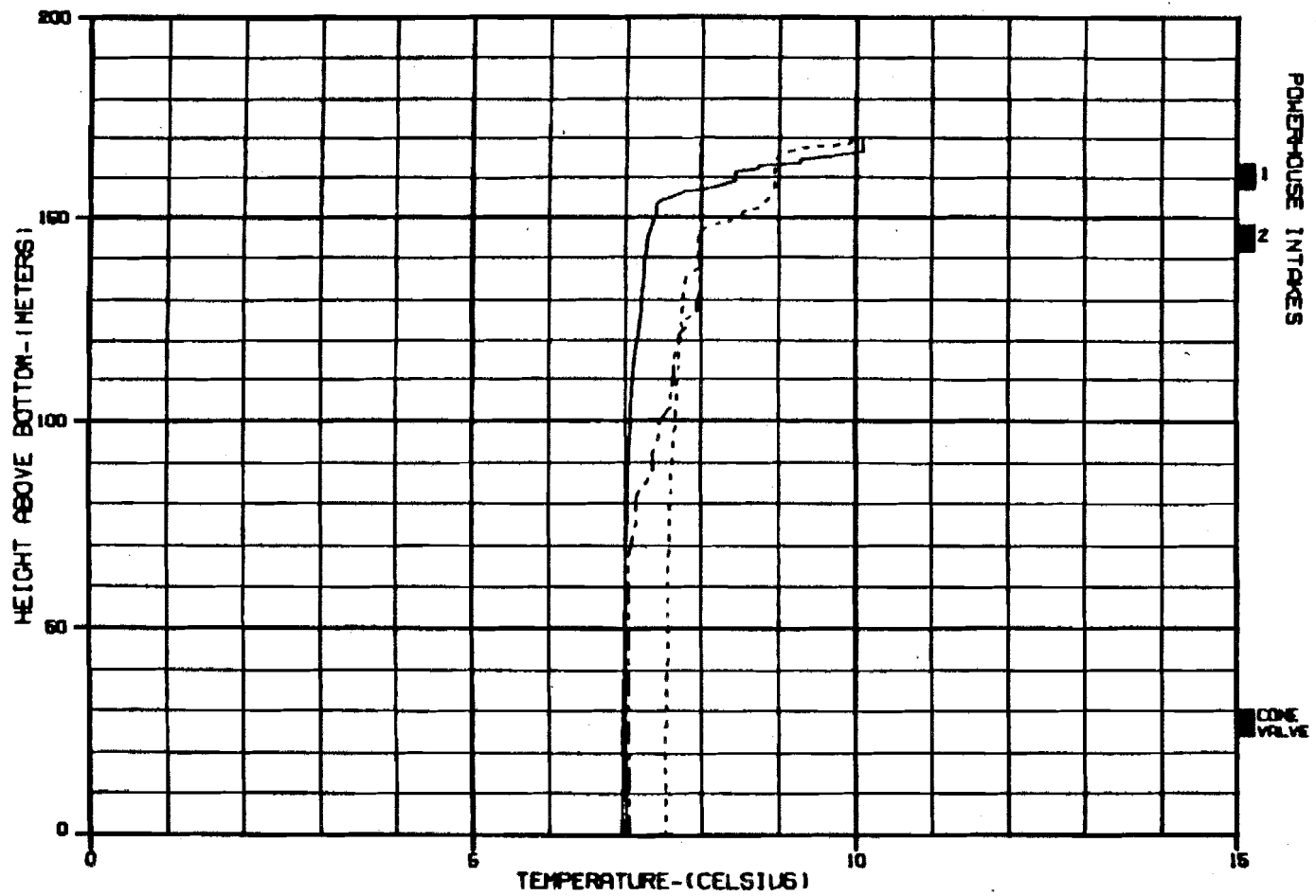
DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

MARZA-EBASCO JOINT VENTURE

OWNER - ALASKA

7 JAN 81

42-010-04



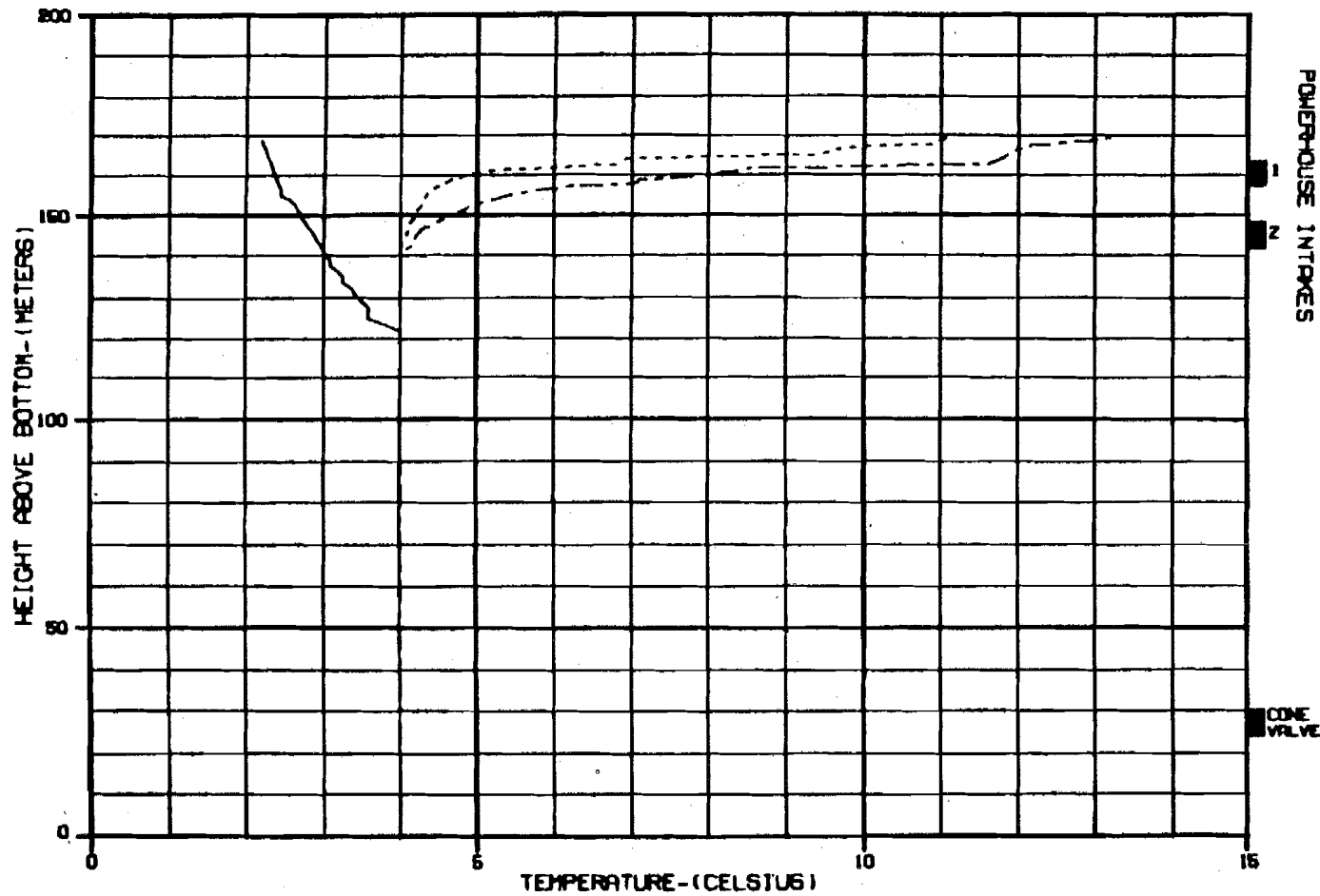
CASE: # DC81182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 #
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- AUGUST 1981
- SEPTEMBER 1981
- - - - - OCTOBER 1981

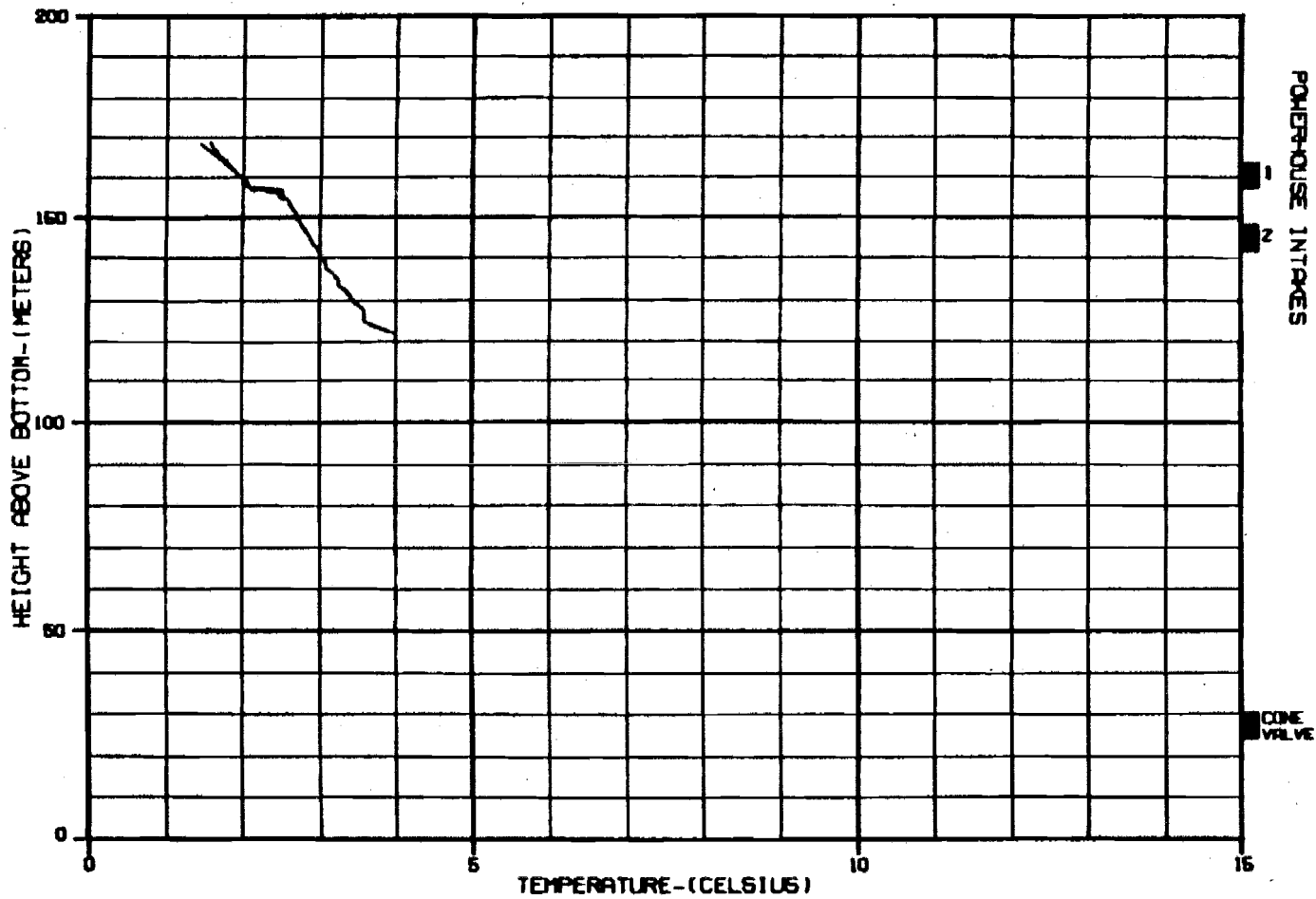
ALASKA POWER AUTHORITY		
DESIGN PROJECT	DRAWING NO.	
DEVIL CANYON RESERVOIR		
TEMPERATURE PROFILES		
WARZA-EBASCO JOINT VENTURE		
DESIGN: S.L.D.M.D.	7 JUN 81	42-010-04



CASE: ■■■ DC81182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■■
 - WATANA WEATHER STATION DATA

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ———— | MAY 1981
 - - - - - | JUNE 1981
 - - - - - | JULY 1981

ALASKA POWER AUTHORITY		
UNITED PROJECT	OPERATION MODEL	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
ISSUED: 04-08-00	7:42 AM	42-010-04



CASE: WDCB1182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | FEBRUARY 1981
 - - - | MARCH 1981
 - · - · | APRIL 1981

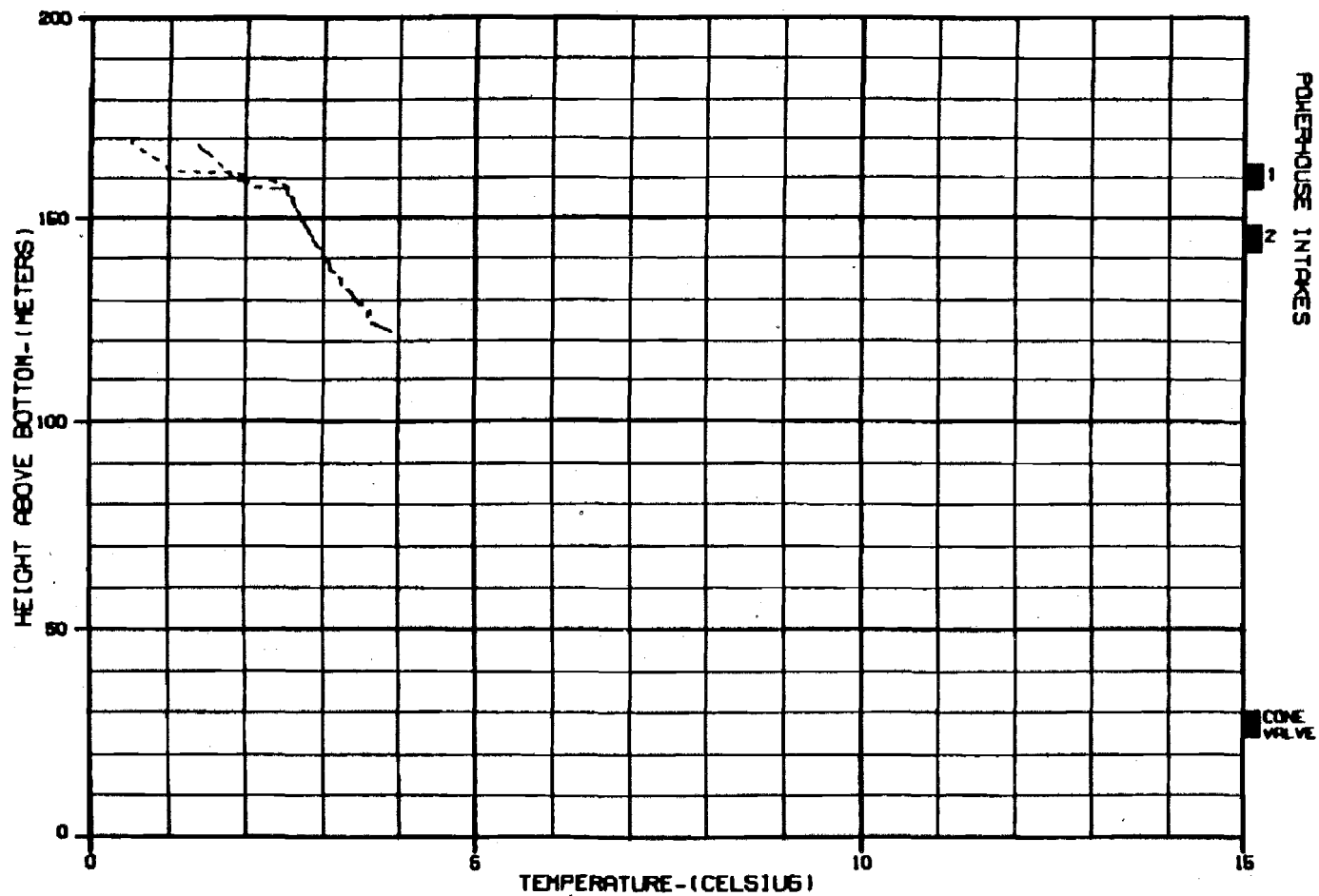
ALASKA POWER AUTHORITY

OUTTA PROJECT | DRYDEN REGR.

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBRACO JOINT VENTURE

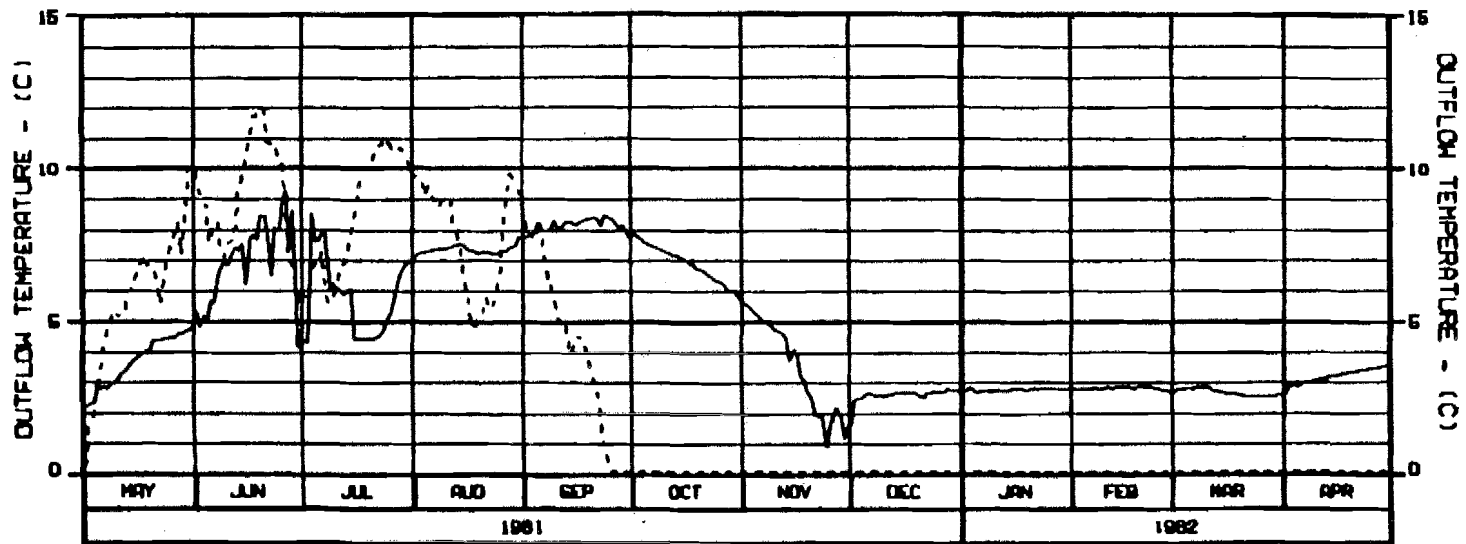
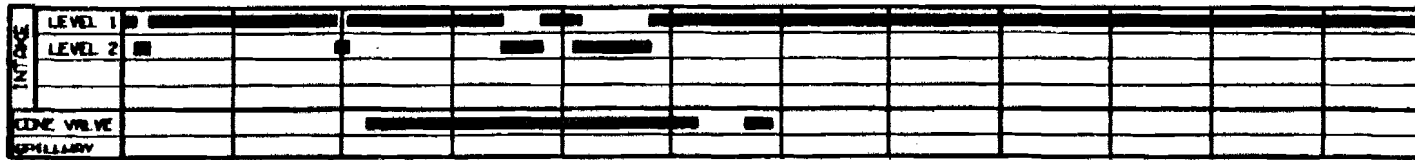
POWER-ALASKA | 7 JAN 81 | 42-010-04



CASE: ■ DC81182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1980
 - - - - - | DECEMBER 1980
 - · - · - | JANUARY 1981

ALASKA POWER AUTHORITY	
PLANT PROJECT	OPERATION
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
WARZA-EBAGOD JOINT VENTURE	
ENCLOS. 81-182102D	7 JAN 81
42-010-04	



LEGEND: CASE: ■ DC81821020 - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■
 - WATANA WEATHER STATION DATA
 — PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - INFLOW TEMPERATURE TO WATANA RESERVOIR

NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1425 FT (434.24 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1276 FT (410.10 M)
 3. CONE VALVE AT ELEVATION 980 FT (299.76 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

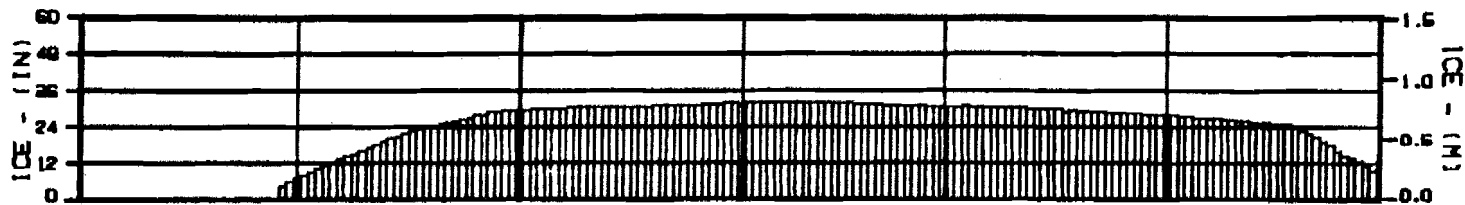
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DIVISION MODEL

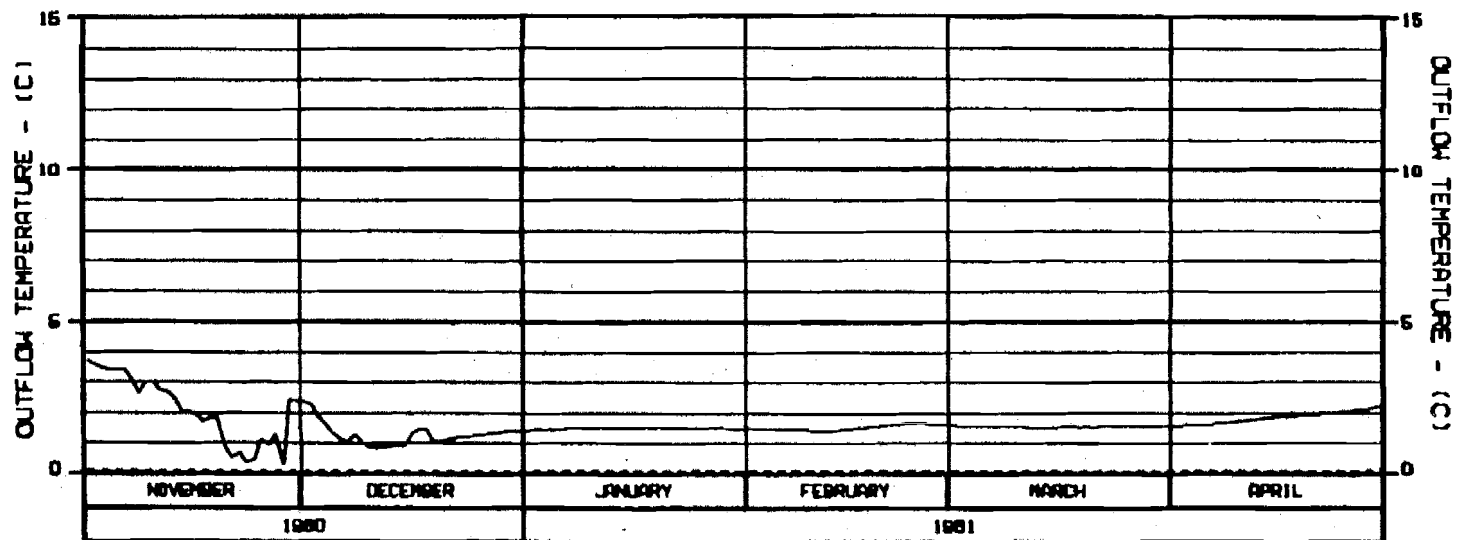
DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DATE: 11/14/82 7 JAN 83 1982, 148, 48, 000, 04



INTAKE	LEVEL 1				
	LEVEL 2				
LINE VALVE					
SPILLWAY					



LEGEND: CASE: ■ DC8182102D - DEVIL CANYON OPERATION WITH MATANA IN 2002 ■
 - MATANA WEATHER STATION DATA
 ——— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1425 FT (434.34 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1375 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 890 FT (271.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

ALASKA POWER AUTHORITY

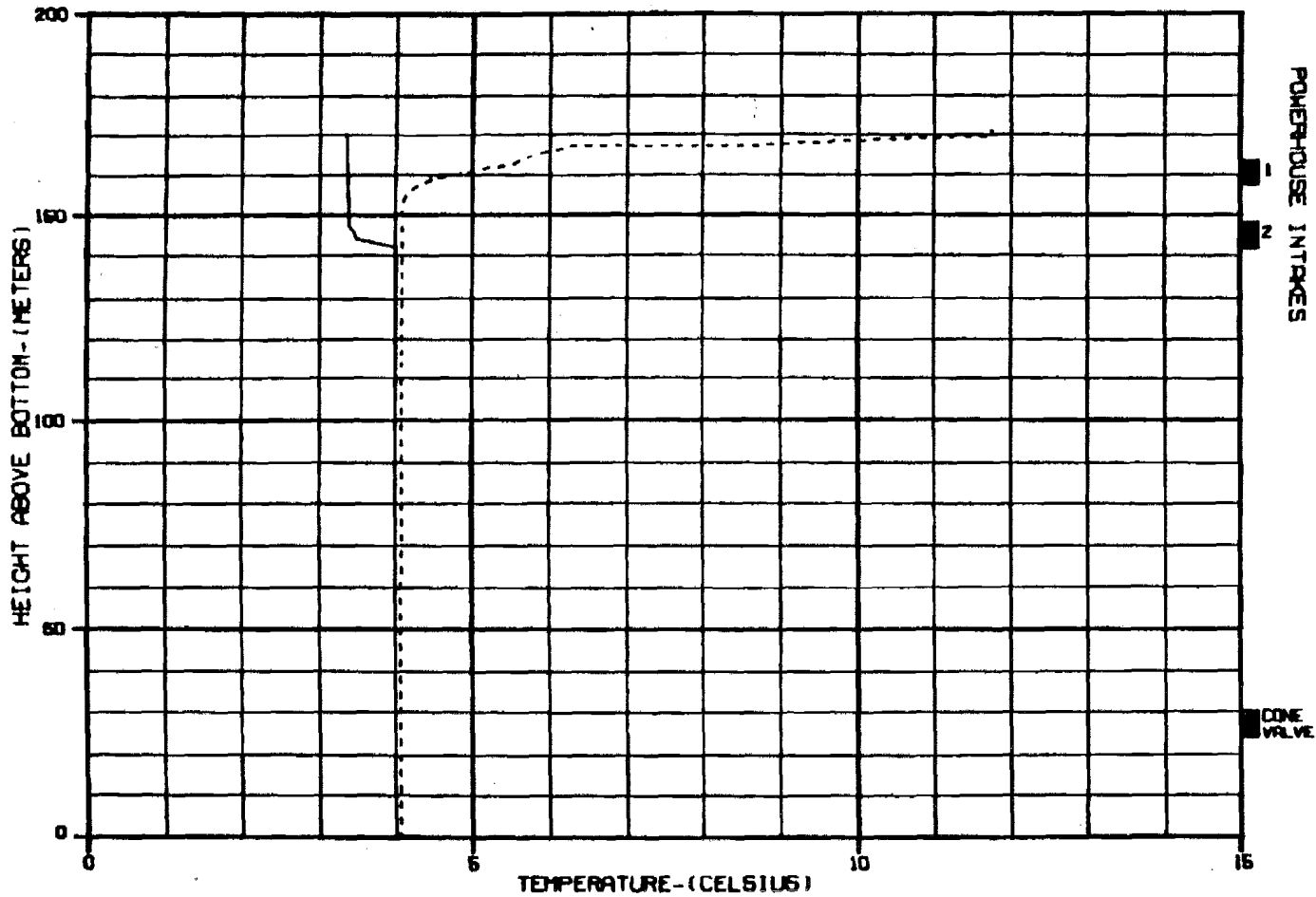
SUBMITTER PROJECT: OYUKON RIVER

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DESIGNER: E.A. BROWN 1 JAN 81 1000.149 45-0000-04

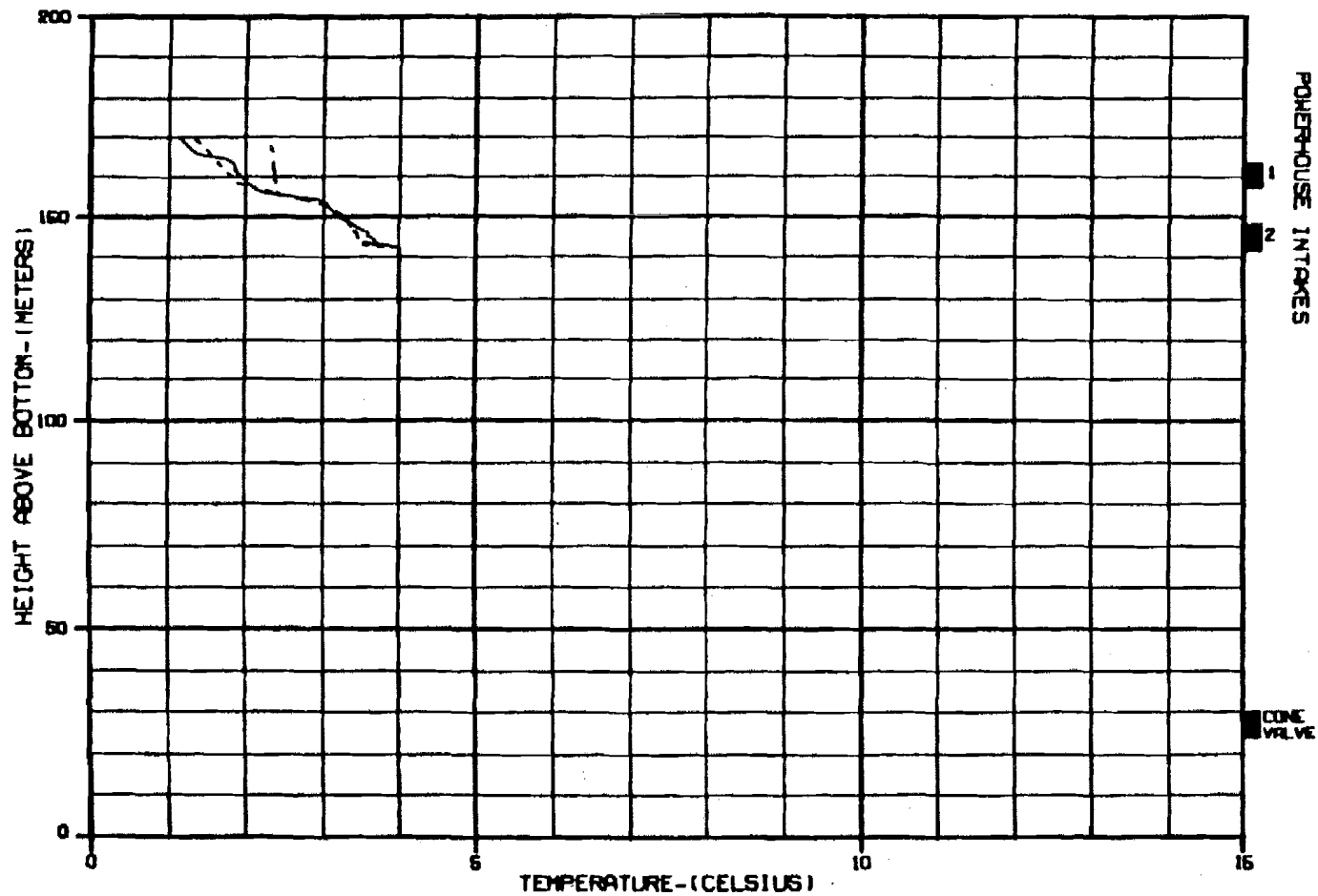
EXHIBIT AN



CASE: # DC81182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 #
 - WATANA WEATHER STATION DATA

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ——— 1 MAY 1993
 - - - - 1 JUNE 1993

ALASKA POWER AUTHORITY		
DESIGN PROJECT	OPERATION PERIOD	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
DRAWN: B.L.DREW	7 JAN 84	42-310-04



CASE: ■■ DCB1182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— 1 FEBRUARY 1983
 - - - - - 1 MARCH 1983
 - · - · - 1 APRIL 1983

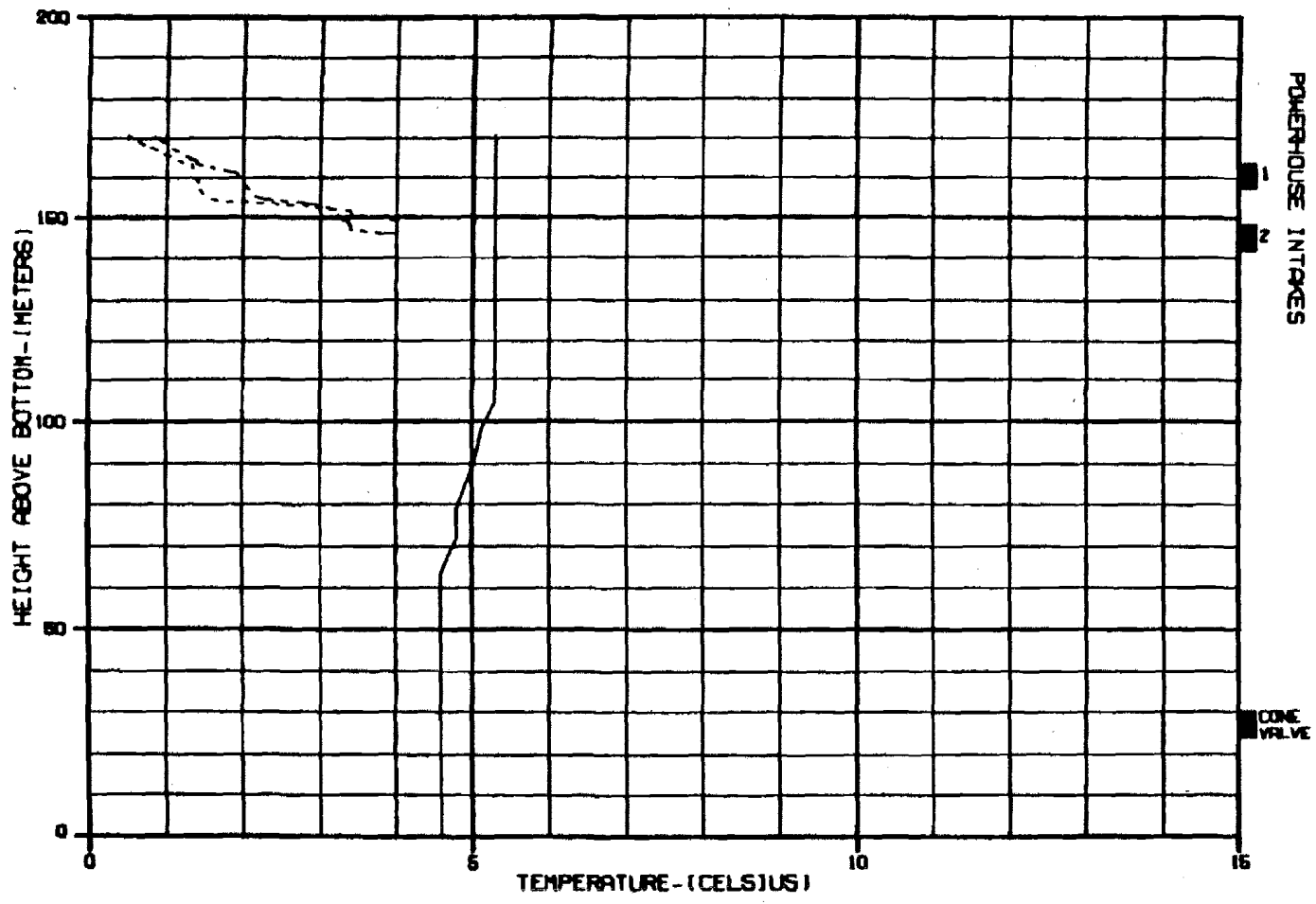
ALASKA POWER AUTHORITY

SUBSTATION PROJECT DIVISION MODEL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBRISCO JOINT VENTURE

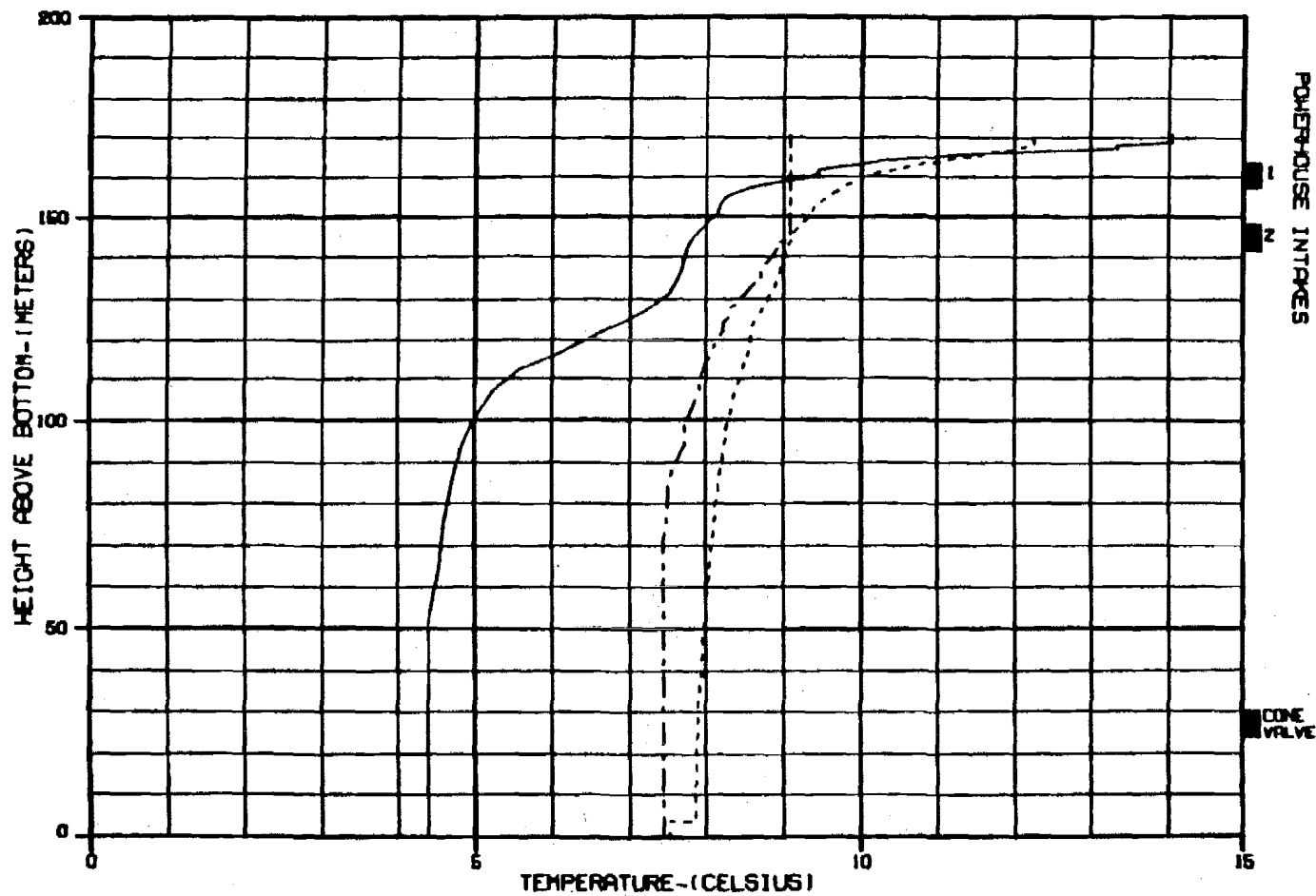
REVISION: 01-1988 T.J.M. 02-010-04



CASE: ■■ DC81182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 ■■
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— 1 NOVEMBER 1982
 - - - - - 1 DECEMBER 1982
 - · - · - 1 JANUARY 1983

ALASKA POWER AUTHORITY	
DESIGN PROJECT	DESIGN MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
HARZA-EBR600 JOINT VENTURE	
VERSION: 11.0-000	7 JAN 83
42-D10-04	



CASE: ■■ DC91182102D - DEVIL CANYON OPERATION WITH NATANA IN 2002 ■■
 - NATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

————— | AUGUST 1982
 - - - - - | SEPTEMBER 1982
 - · - · - | OCTOBER 1982

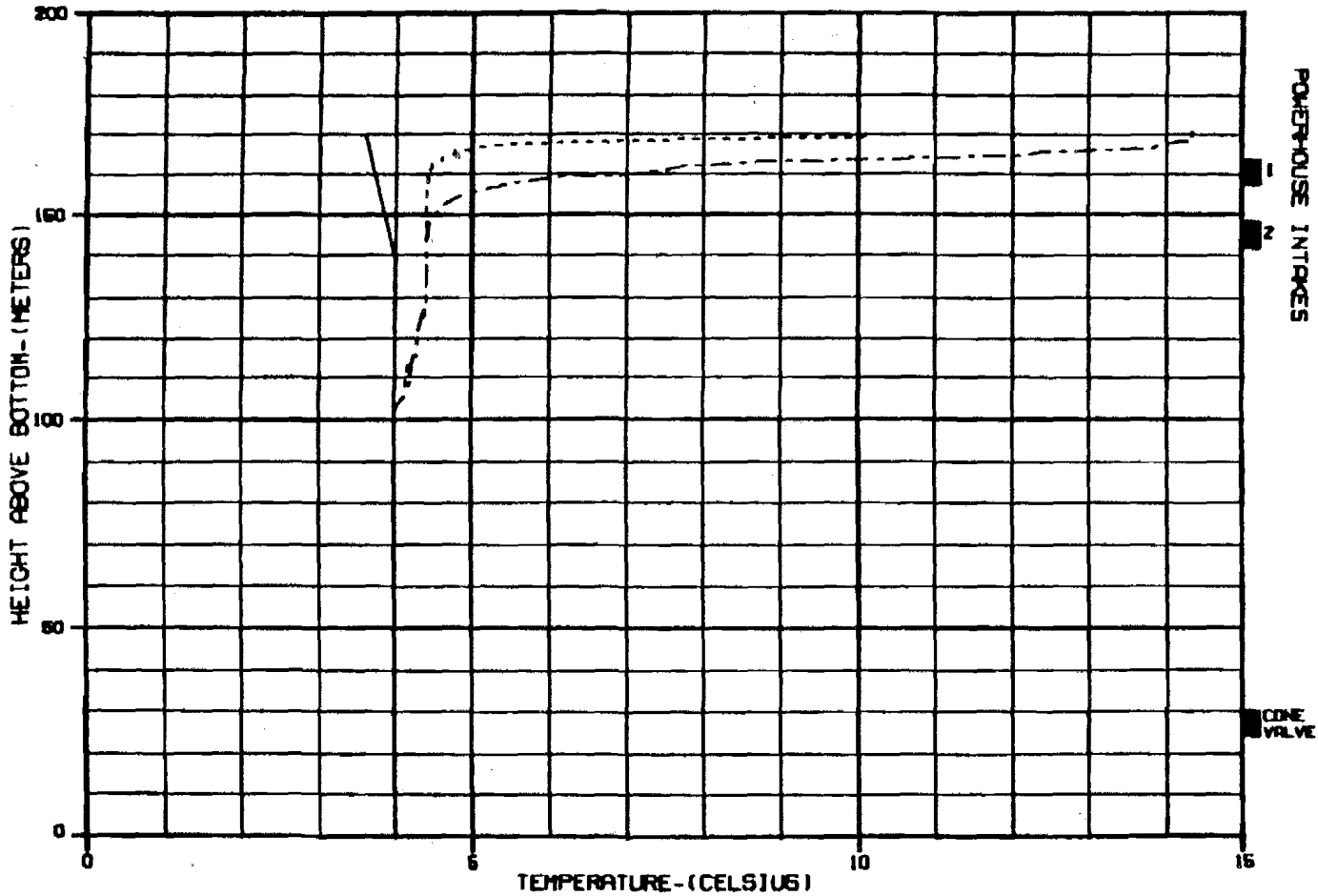
ALASKA POWER AUTHORITY

SUBMITTA PROJECT | DESIGN MODEL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HAZA-EBRACD JOINT VENTURE

ISSUED: 14 FEB 83 | 7 JAN 84 | 42-010-04



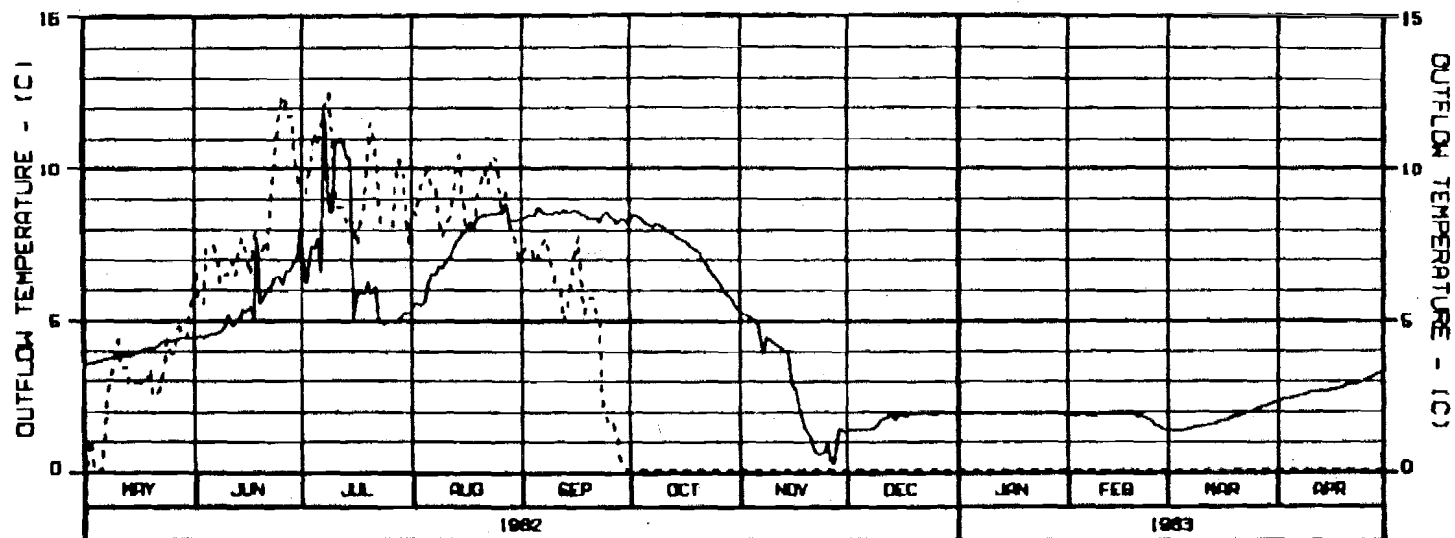
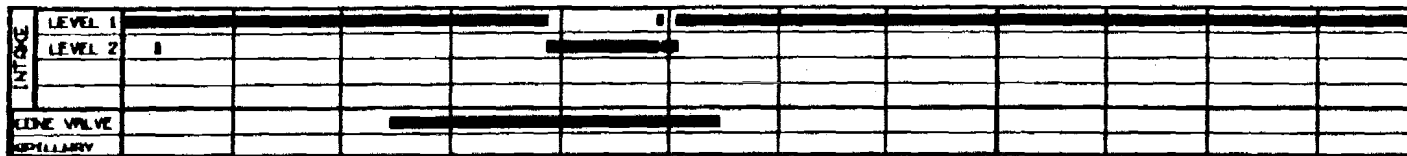
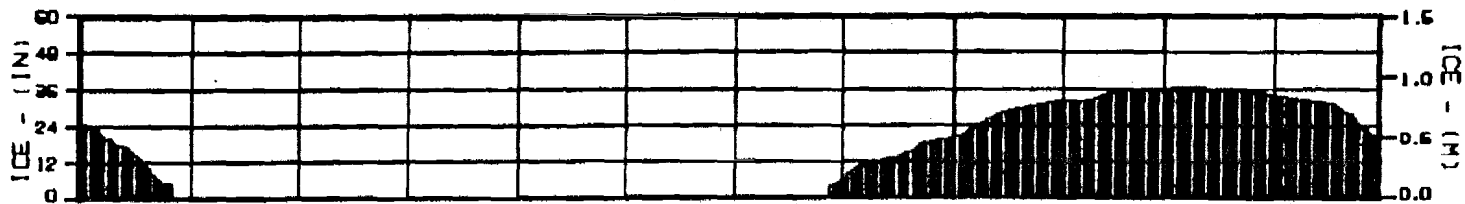
CASE: WDCB1182102D - DEVIL CANYON OPERATION WITH WATANA IN 2002 W
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- MAY 1982
- JUNE 1982
- JULY 1982

ALASKA POWER AUTHORITY	
QUALITY PROJECT	OPERATION MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
WARZA-EBRSCO JOINT VENTURE	
ISSUED: 01/08/82	42-010-04



LEGEND: CASE: ■ DC81182102D - DEVIL CANYON OPERATION WITH MATANA IN 2002 ■
 - WATANA WEATHER STATION DATA
 — PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1425 FT (434.24 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1275 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 980 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.84 M)

ALASKA POWER AUTHORITY

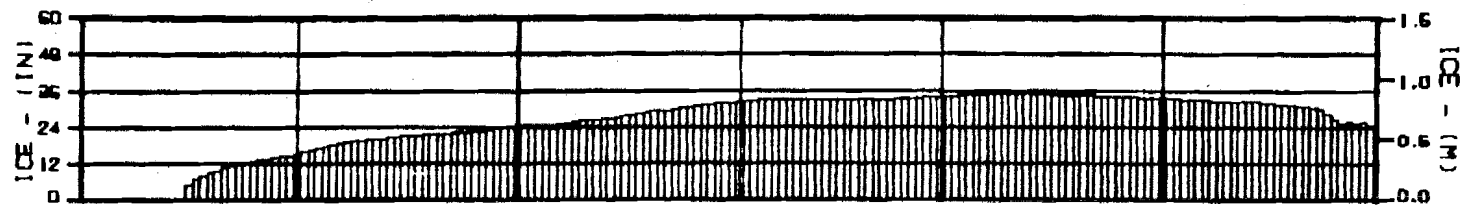
SUBMITTA PROJECT	OPERATION MODEL
DEVIL CANYON RESERVOIR	
OUTFLOW TEMPERATURE	
AND ICE GROWTH	

HARZA-EBRACCO JOINT VENTURE

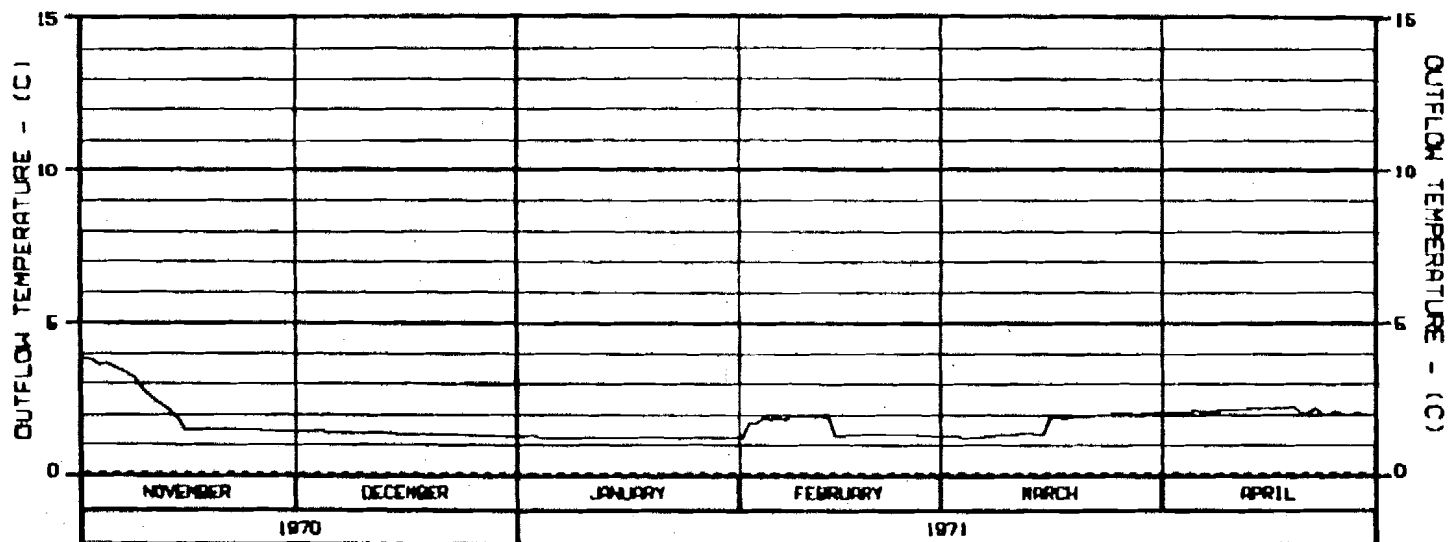
CHANGES: ALL PAGES 7 JAN 84 8888.148.48.000-04

WATANA AND DEVIL CANYON OPERATING
2020 Energy Demands
Devil Canyon Reservoir Temperatures

EXHIBIT AO



INTAKE	LEVEL 1					
	LEVEL 2					
	CONE VALVE					
	SPILLWAY					



LEGEND: CASE: ■ DC7120A - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■

———— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.84 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1376 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.76 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.84 M)

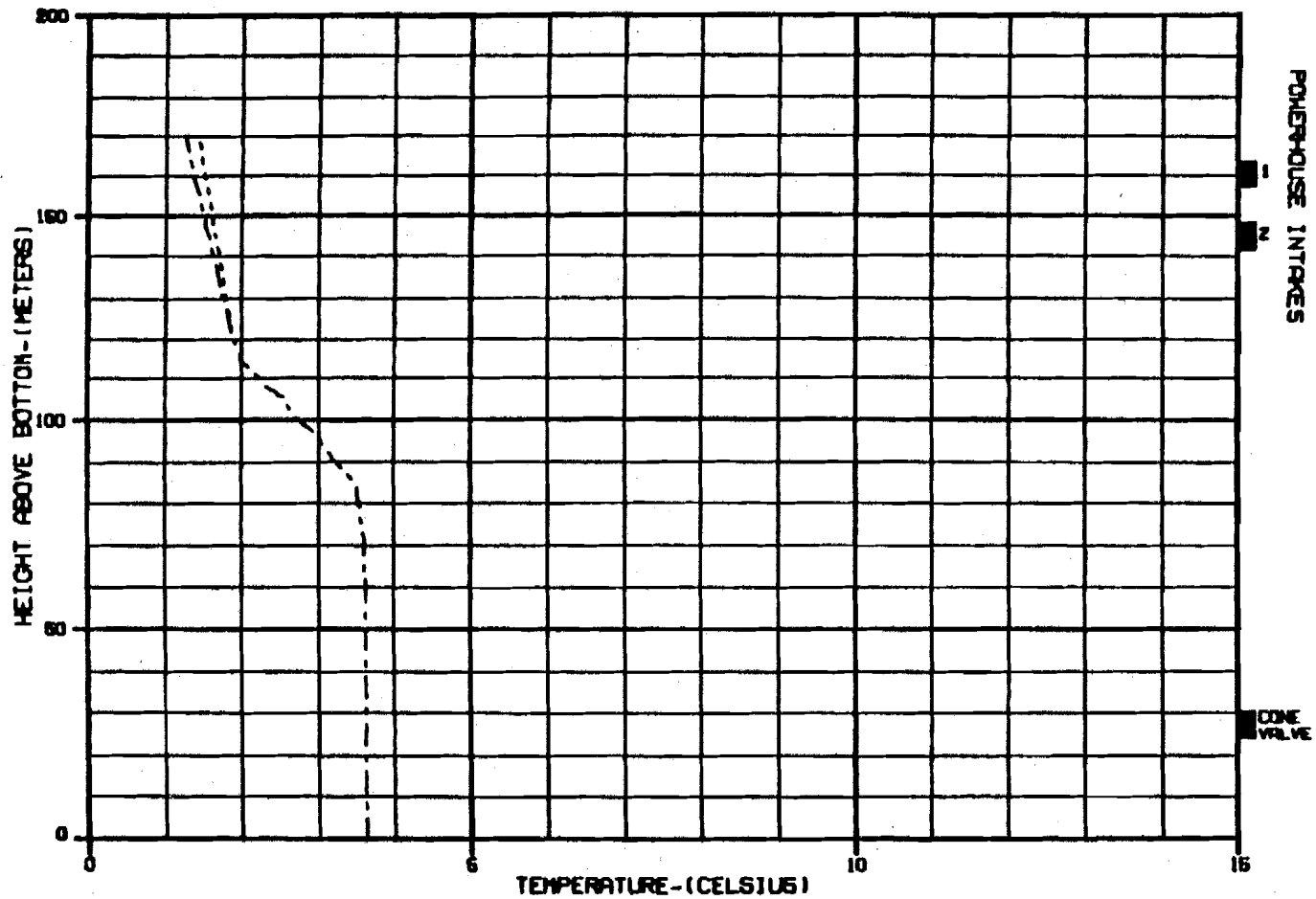
ALASKA POWER AUTHORITY

DEVIL CANYON PROJECT | OPENING MODEL

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DESIGN: ALP/RS | 9 JAN 81 | REV. 142-AS-010-24



CASE: ■■ DC7120A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | NOVEMBER 1970
- - - | DECEMBER 1970
- · - · | JANUARY 1971

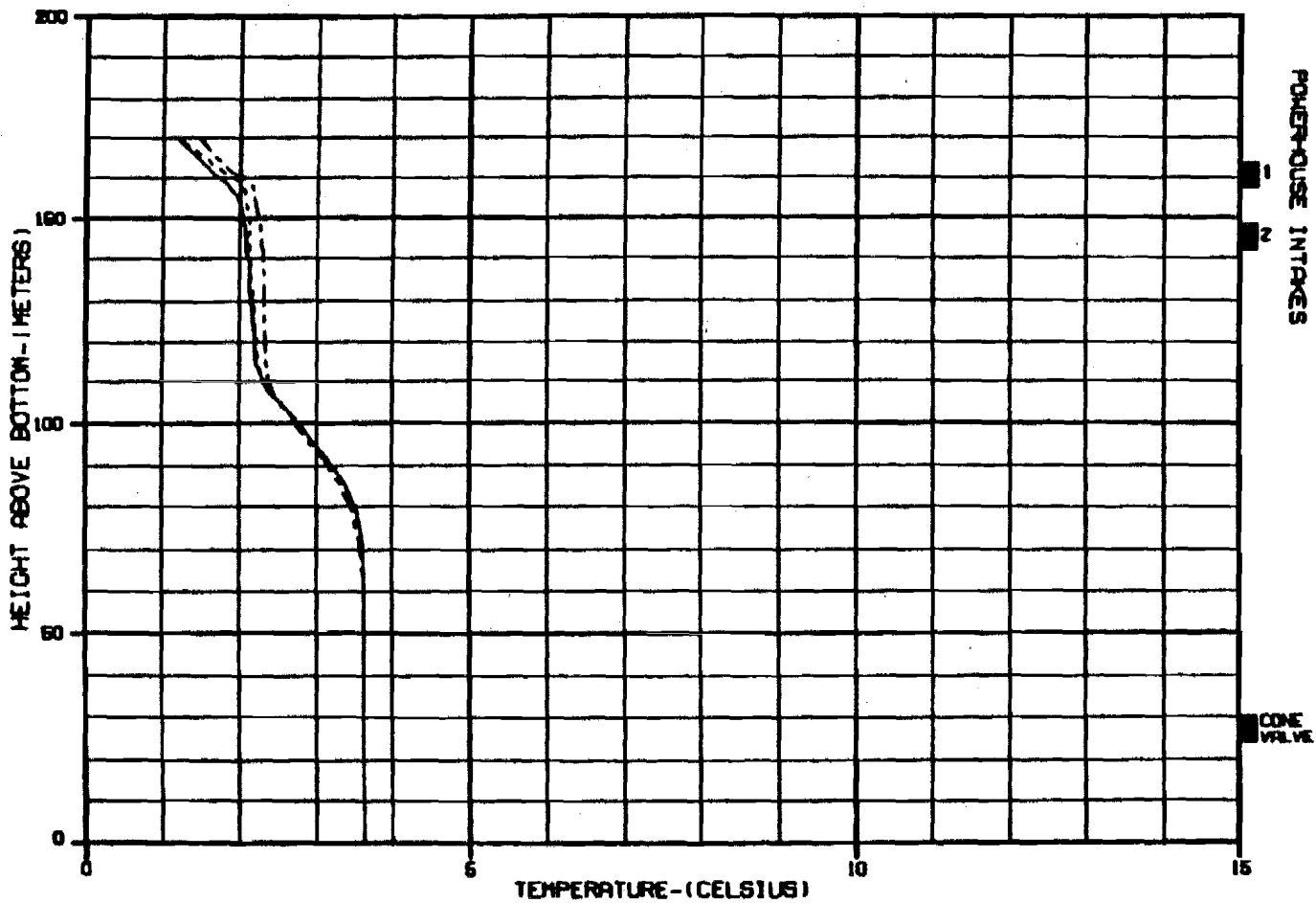
ALASKA POWER AUTHORITY

DEVELOPMENT PROJECT | OPERATIONAL NEEDS

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILE 6

HARZA-EBRACO JOINT VENTURE

DESIGN - ELDON | 2 JAN 81 | 42-010-04



CASE: ■■ DC7120A - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— | FEBRUARY 1971
 | MARCH 1971
 - - - - | APRIL 1971

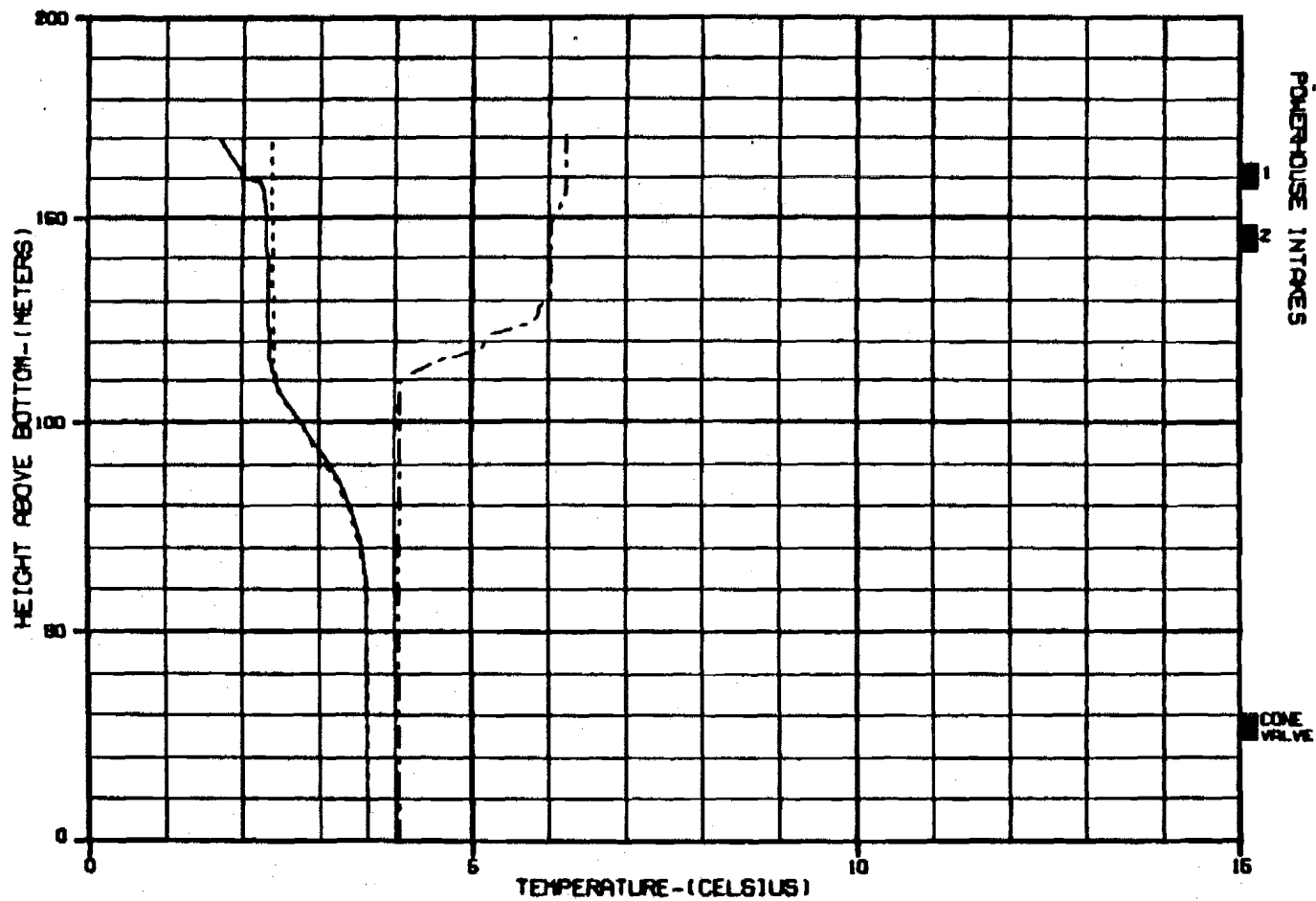
ALASKA POWER AUTHORITY

UNITED PROJECT ENERGY MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

UNIVERSITY OF ALASKA 0 JAN 81 02-010-04



CASE: DC7120A - DEVIL CANYON OPERATION WITH WATANA IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | MAY 1971
 - - - - - | JUNE 1971
 - - - - - | JULY 1971

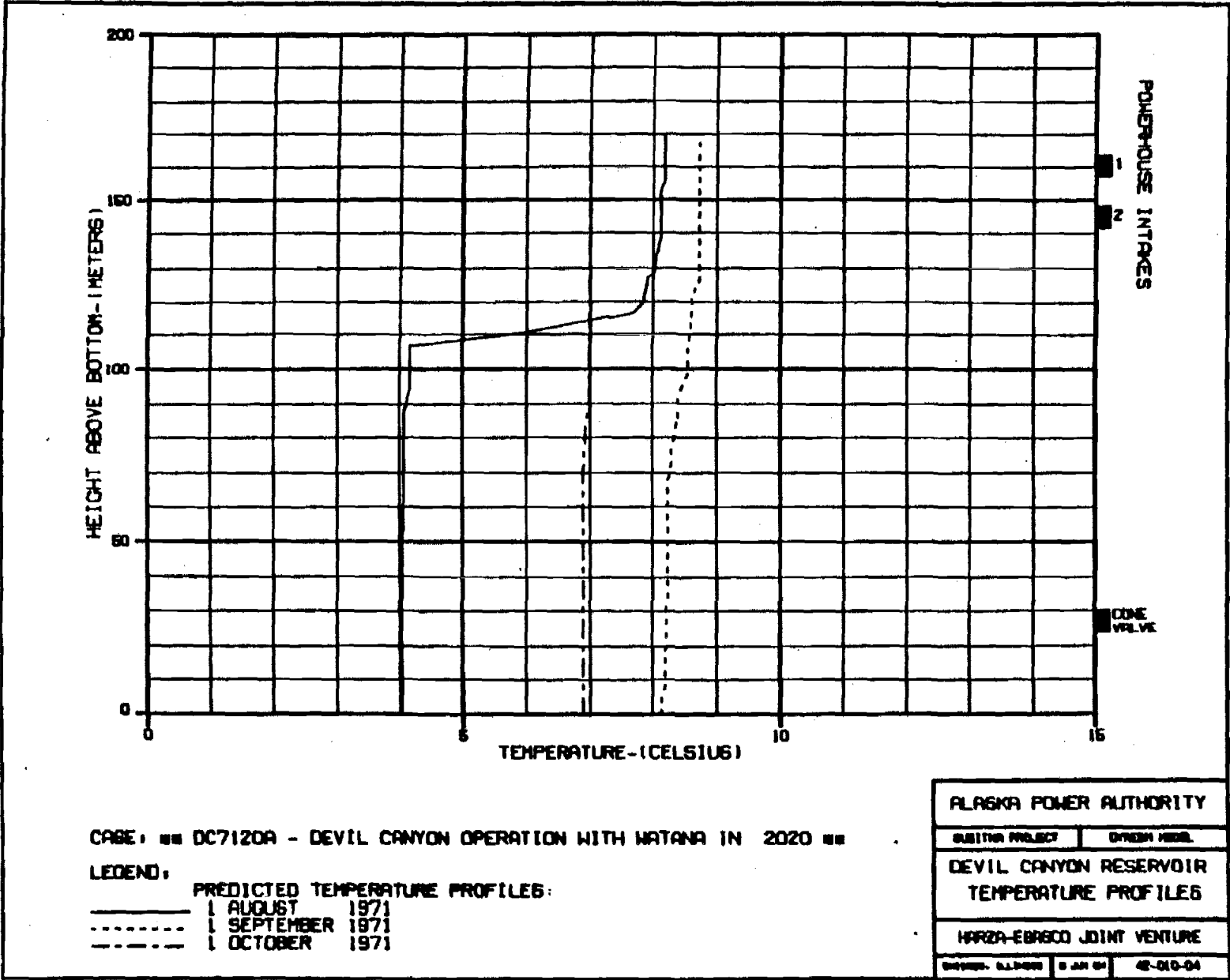
ALASKA POWER AUTHORITY

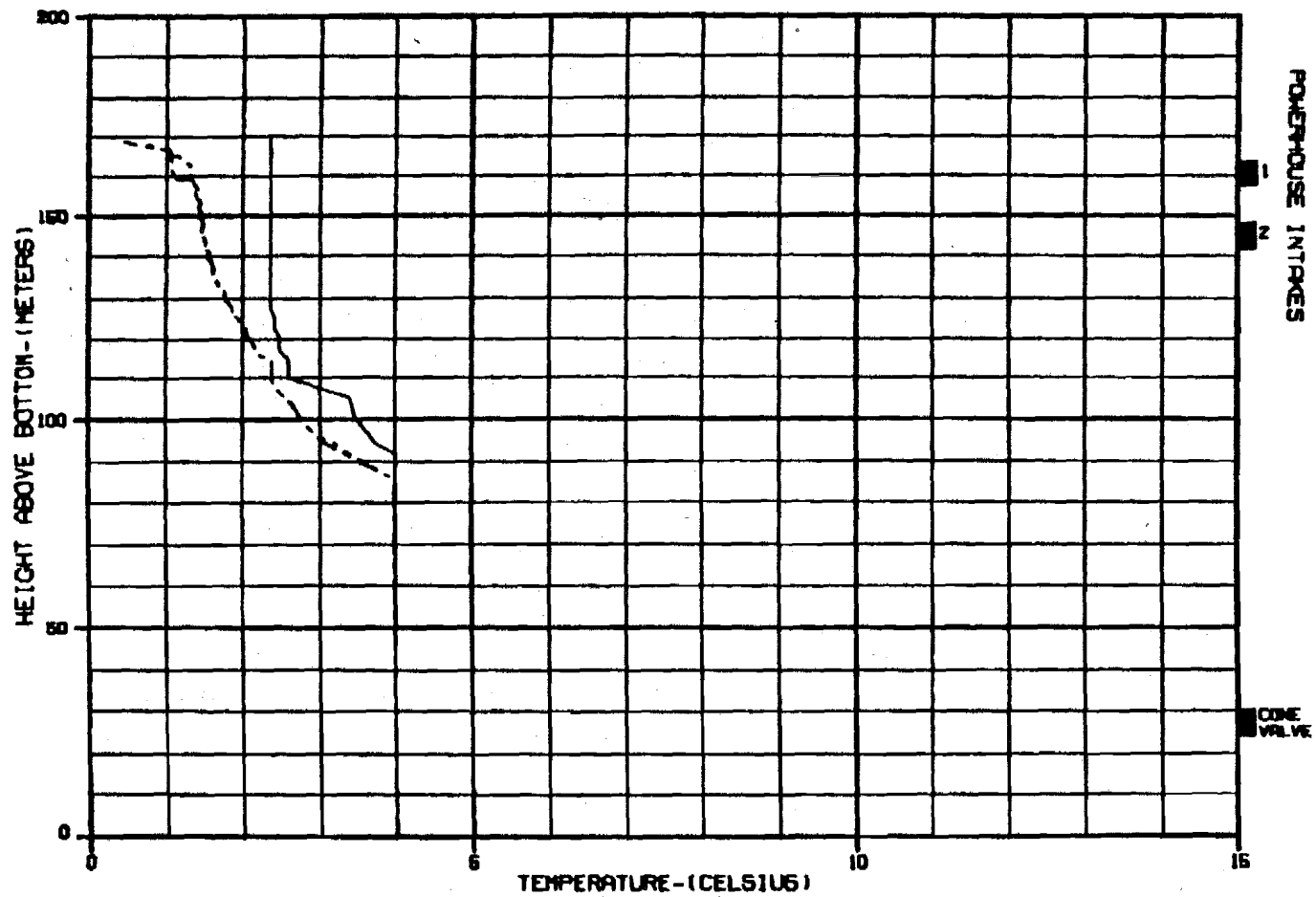
SUBMITTAL PROJECT OPERATIONAL PERIOD

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

DESIGNER: ALASKA POWER AUTHORITY 8 JAN 81 48-010-04





CASE: ■■ DC7120A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | NOVEMBER 1971
 | DECEMBER 1971
 - - - - - | JANUARY 1972

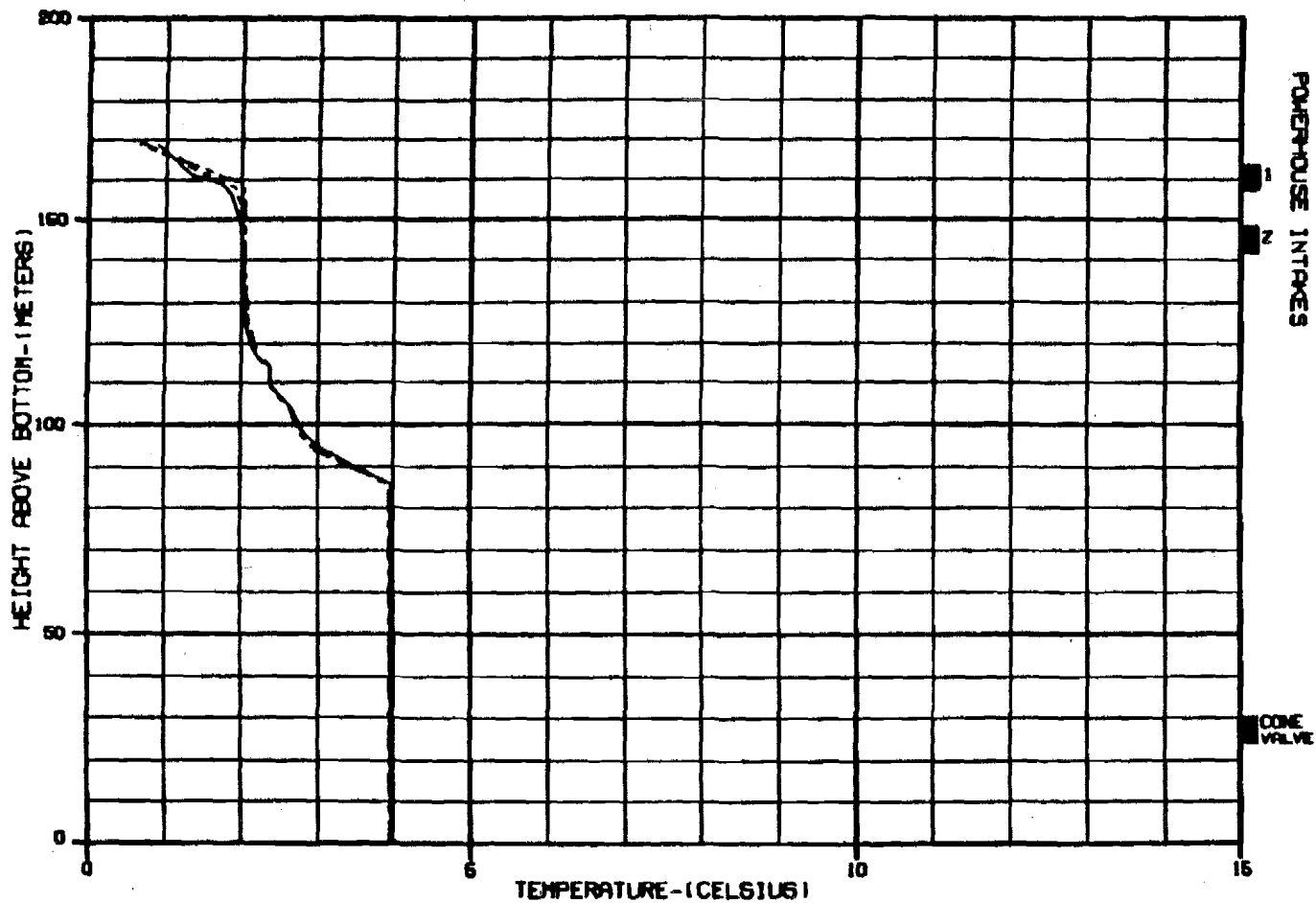
ALASKA POWER AUTHORITY

SUBMITTA PROJECT GREEN HEDL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HRZA-EBR600 JOINT VENTURE

PREPARED BY: RALPH W. BROWN 8 JAN 82 42-010-04



CASE: ■■ DC7120A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | FEBRUARY 1972
 | MARCH 1972
 - - - - - | APRIL 1972

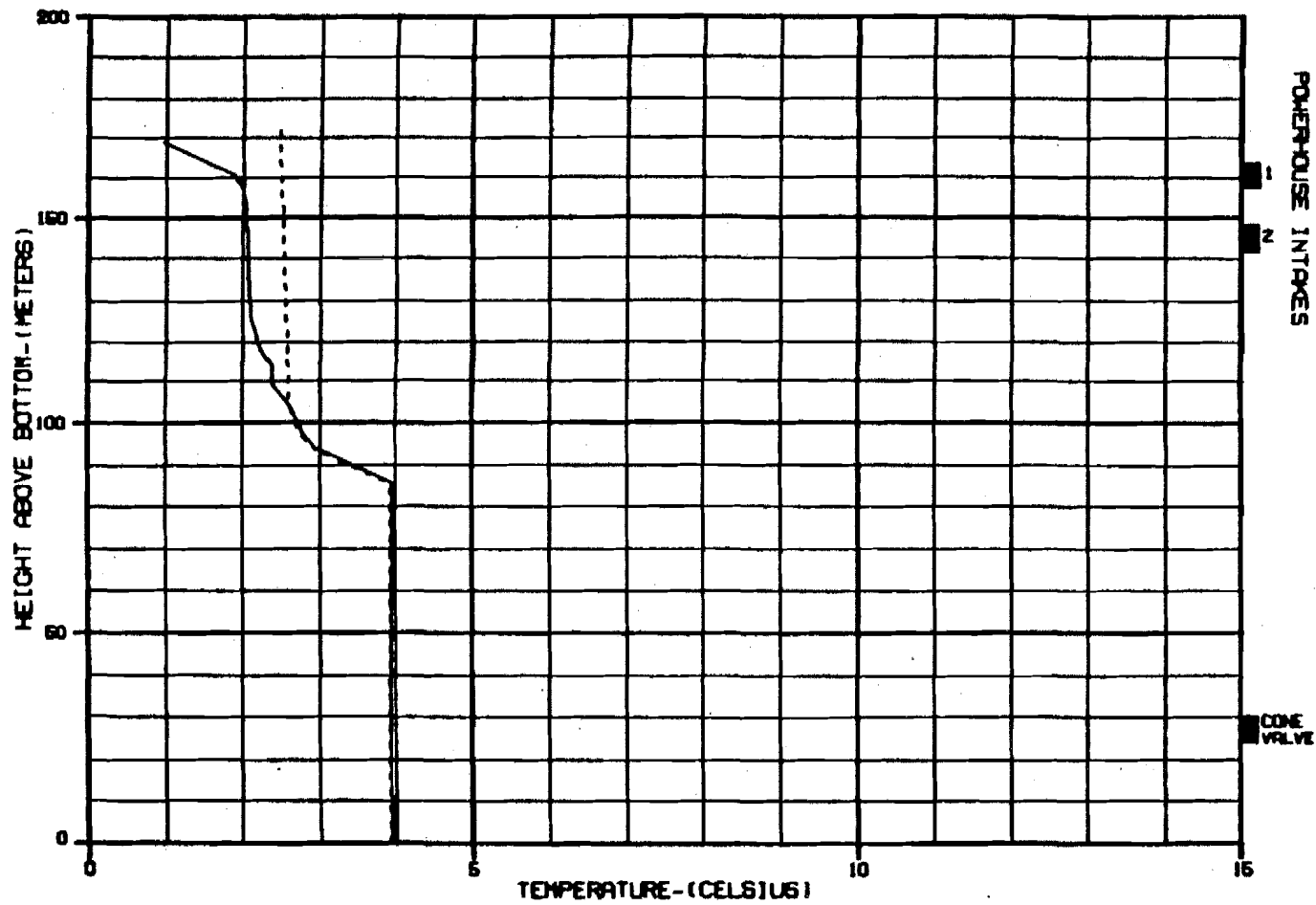
ALASKA POWER AUTHORITY

SLISTON PROJECT GREEN HEDD.

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DATE: 11/20/82 9 AM '82 4-010-04



CASE: DC7120A - DEVIL CANYON OPERATION WITH WATANA IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— MAY 1972
 - - - - - JUNE 1972
 - · - · - JULY 1972

ALASKA POWER AUTHORITY

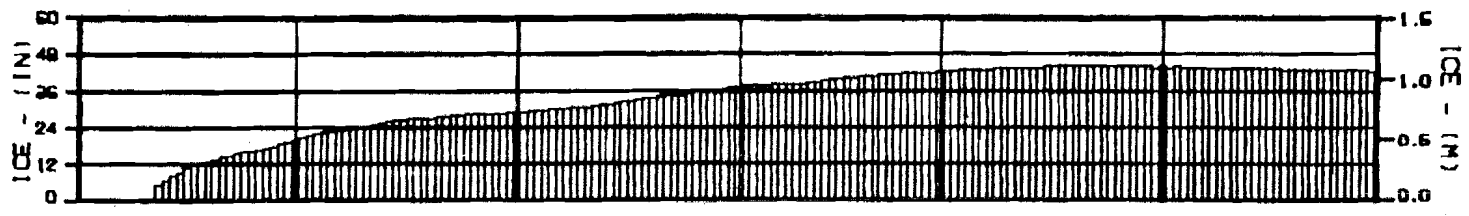
DEVELOPMENT PROJECT OPERATIONAL MODEL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

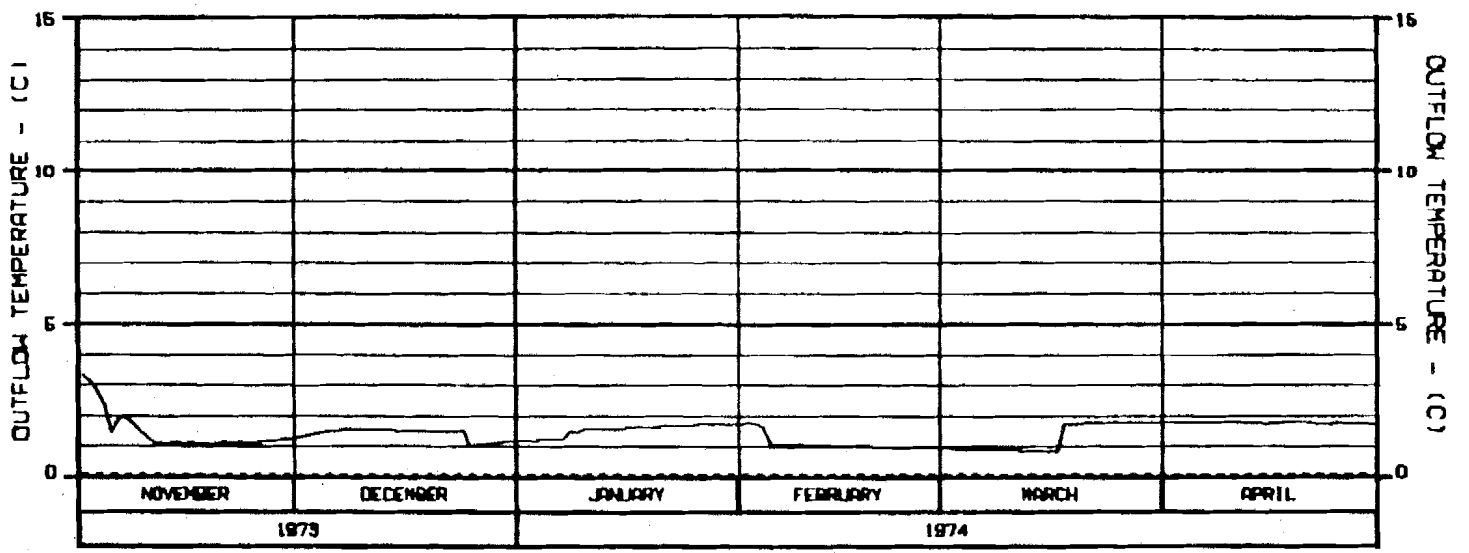
HARZA-EBRDC JOINT VENTURE

DESIGN: 44-0000 0 JAN 84 4E-010-04

EXHIBIT AP



INTAKE	LEVEL 1					
	LEVEL 2					
CONE VALVE						
SPILLWAY						

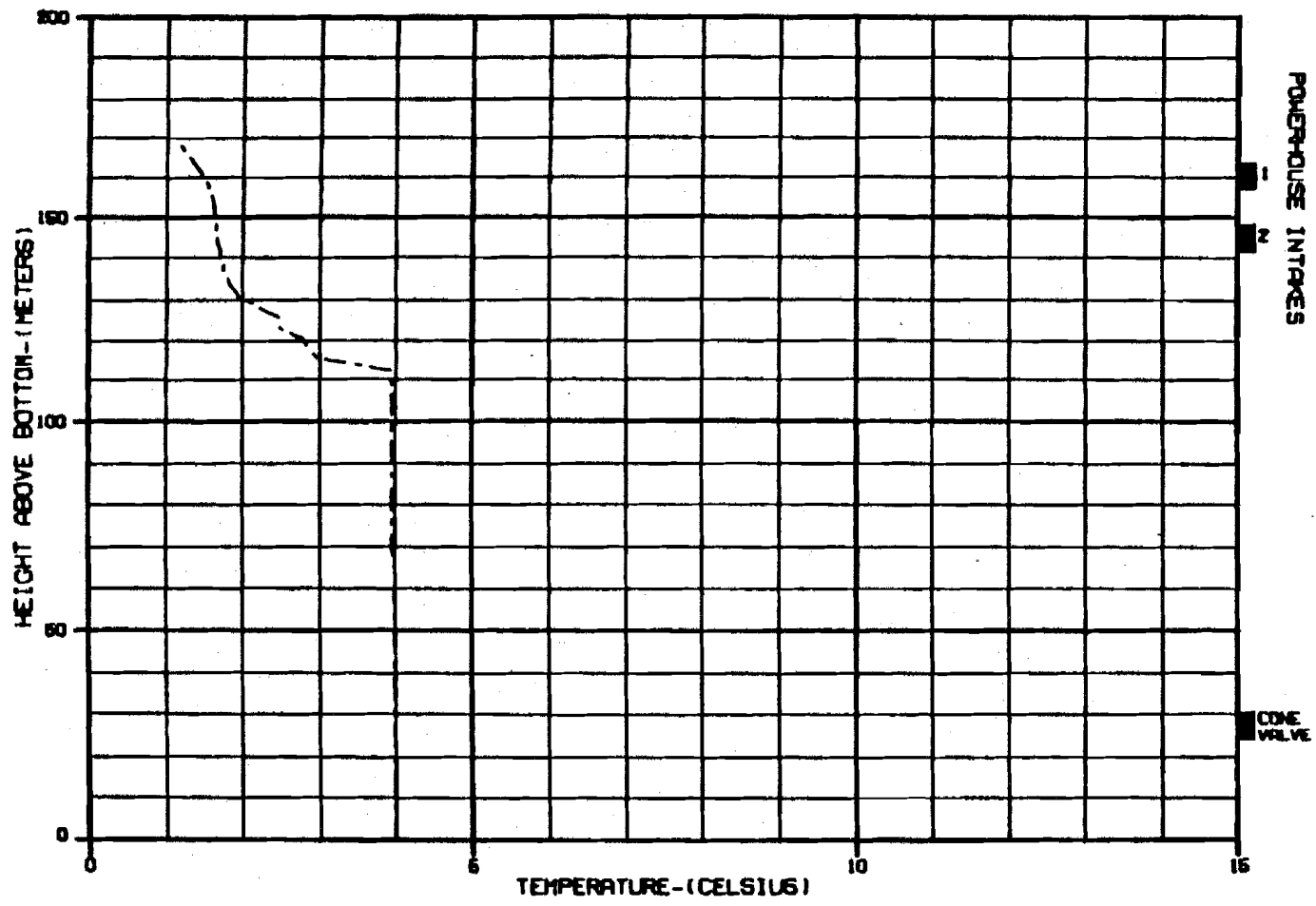


LEGEND: CASE: ■ DC7420A - DEVIL CANYON OPERATION WITH NATANA IN 2020 ■■

———— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO NATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.34 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1276 FT (410.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.84 M)

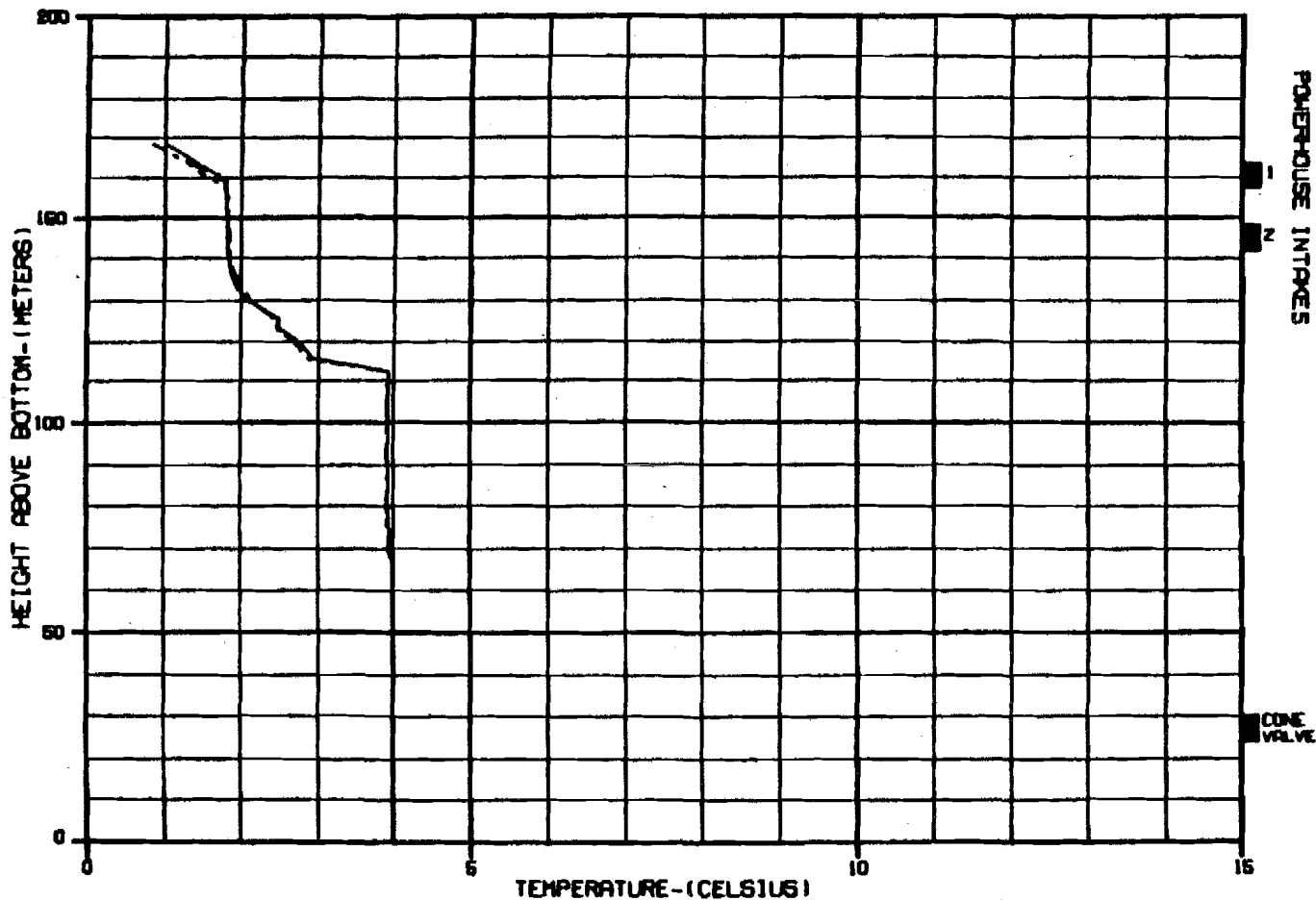
ALASKA POWER AUTHORITY	
SMITHA PROJECT	DEVIL CANYON
DEVIL CANYON RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH	
WARZA-EBRACO JOINT VENTURE	
DESIGN: S.L. PETER	8 JAN 84
MORNING: 147-48-940-24	



CASE: ■■ DC7420A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1973
 - - - - - | DECEMBER 1973
 - · - · - | JANUARY 1974

ALASKA POWER AUTHORITY		
SUBJECT PROJECT	DRAWING NO.	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBRARD JOINT VENTURE		
DESIGNED BY	DRAWN BY	DATE
		4-21-74



CASE: ■ DC7420A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— | FEBRUARY 1974
 - - - - | MARCH 1974
 - - - - | APRIL 1974

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

OPENING MODEL

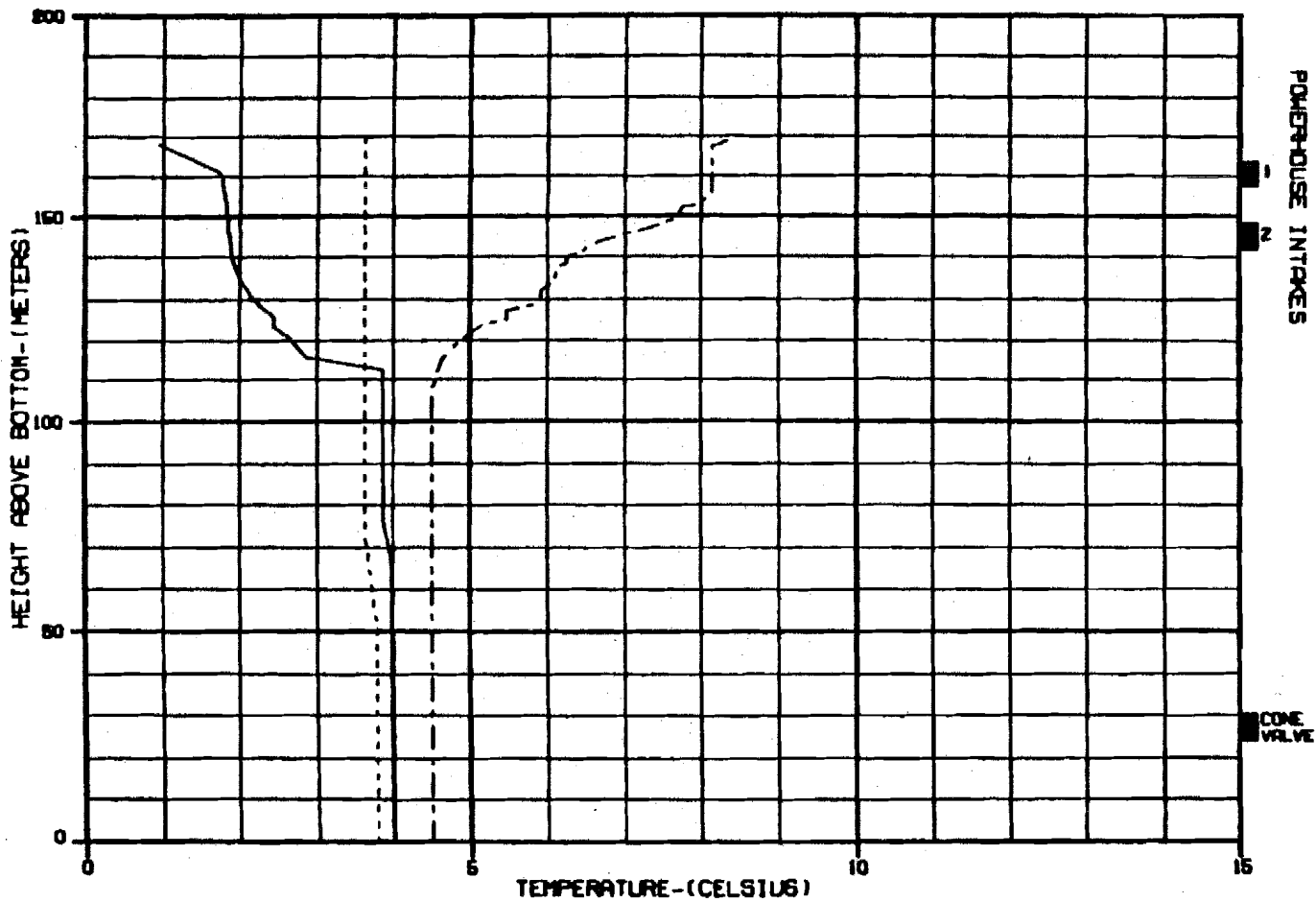
DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EREGCO JOINT VENTURE

DESIGN - 01-0000

8 JAN 81

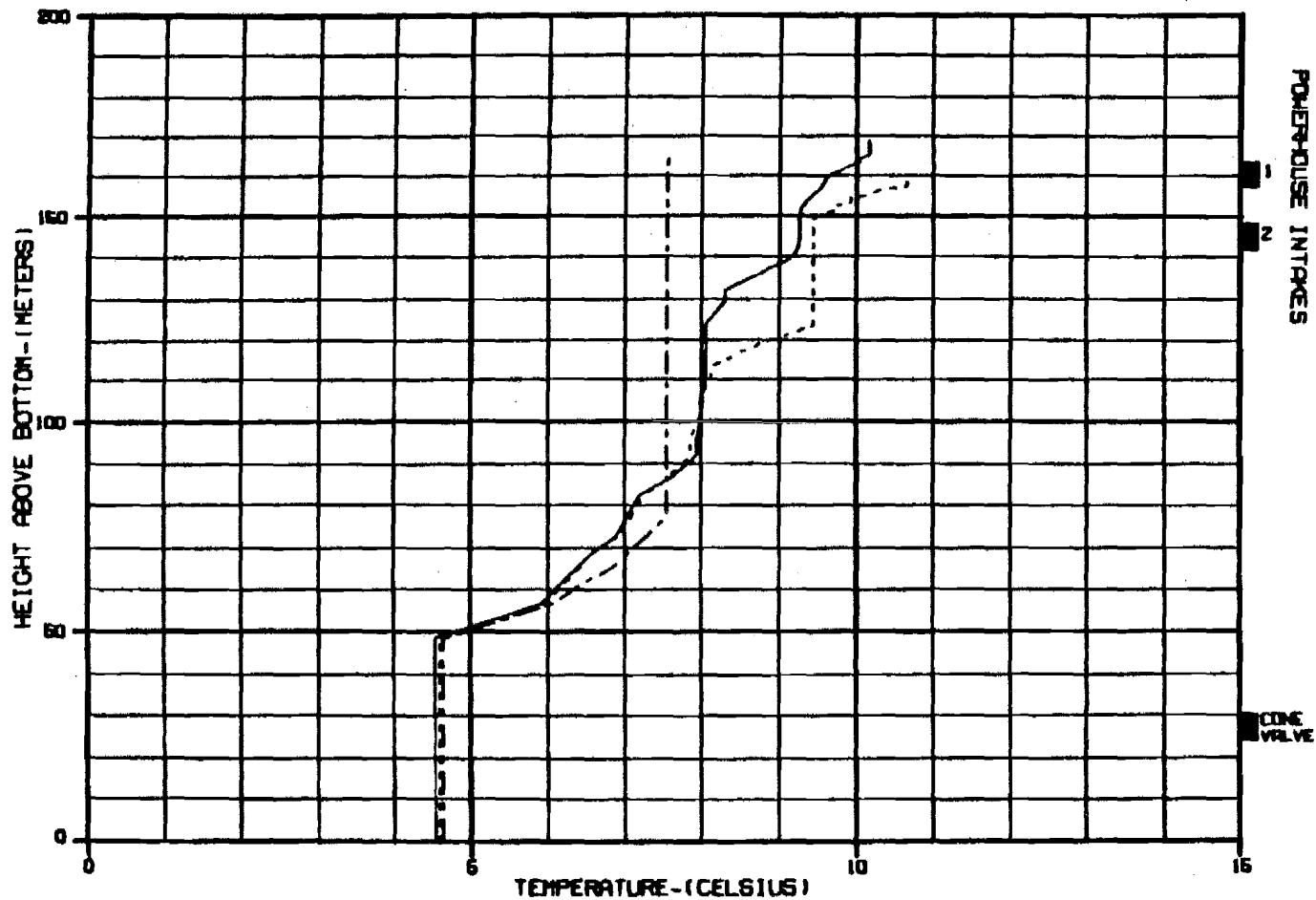
42-010-04



CASE: ■ DC7420A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | MAY 1974
 | JUNE 1974
 - - - - | JULY 1974

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT	OPERATION MODEL	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
WARZA-EBRACCO JOINT VENTURE		
DATE: 11-20-74	BY: JAC/SH	42-010-04



CASE: ■ DC7420A - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- | AUGUST 1974
- | SEPTEMBER 1974
- - - - | OCTOBER 1974

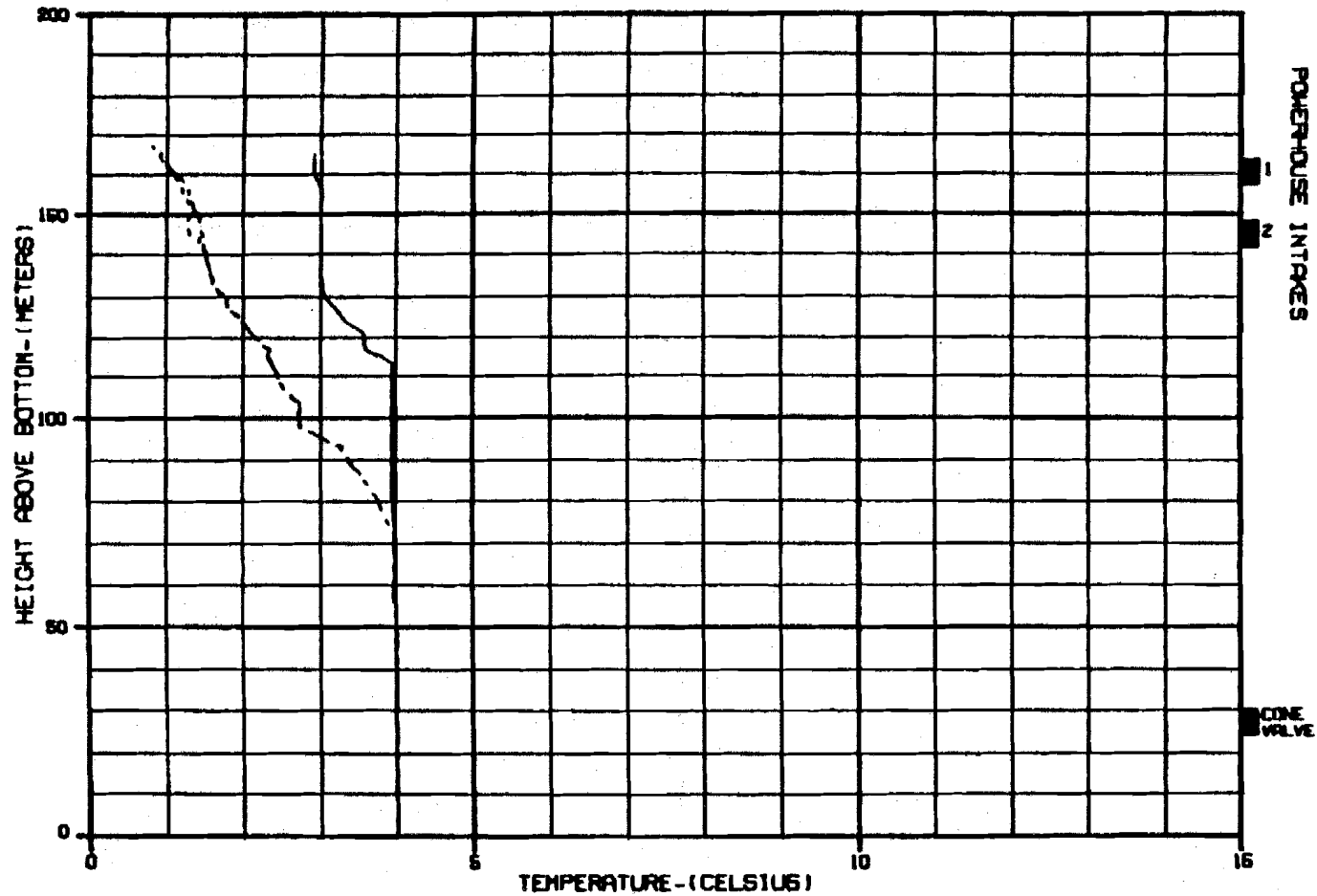
ALASKA POWER AUTHORITY

EXISTING PROJECT | OTHER NEED

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRACO JOINT VENTURE

DRAWN: B.L.D. 8 JAN 81 42-910-04



CASE: ■■ DC7420A - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 NOVEMBER 1974
- 1 DECEMBER 1974
- - - - - 1 JANUARY 1975

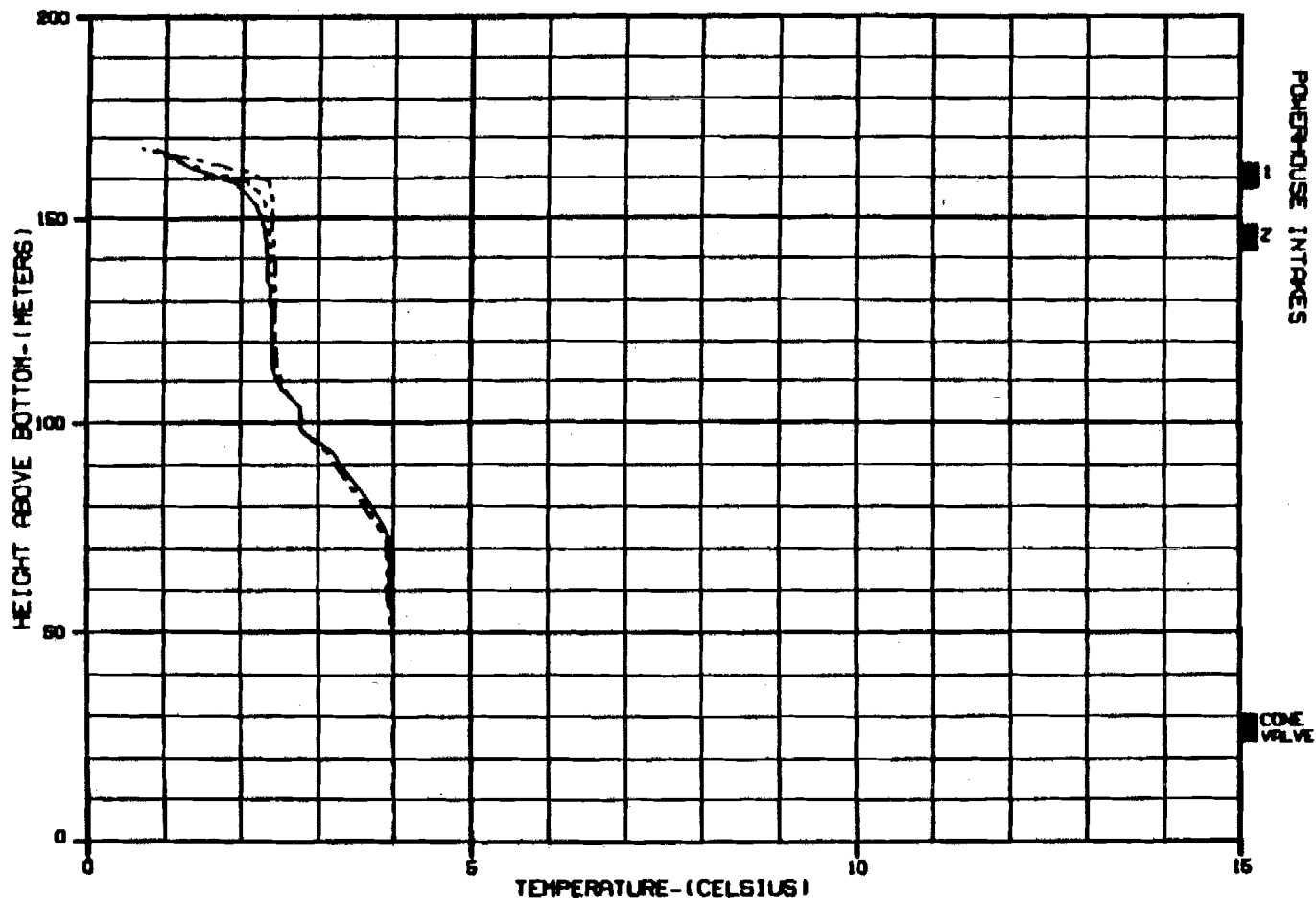
ALASKA POWER AUTHORITY

DEVELOPER PROJECT OPERATOR FIELD

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

WARZA-EBRARD JOINT VENTURE

DESIGNED BY: [] DRAWN BY: [] DATE: 4-21-84



CASE: ■■ DC7420A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

———— | FEBRUARY 1975
 - - - - | MARCH 1975
 - · - · | APRIL 1975

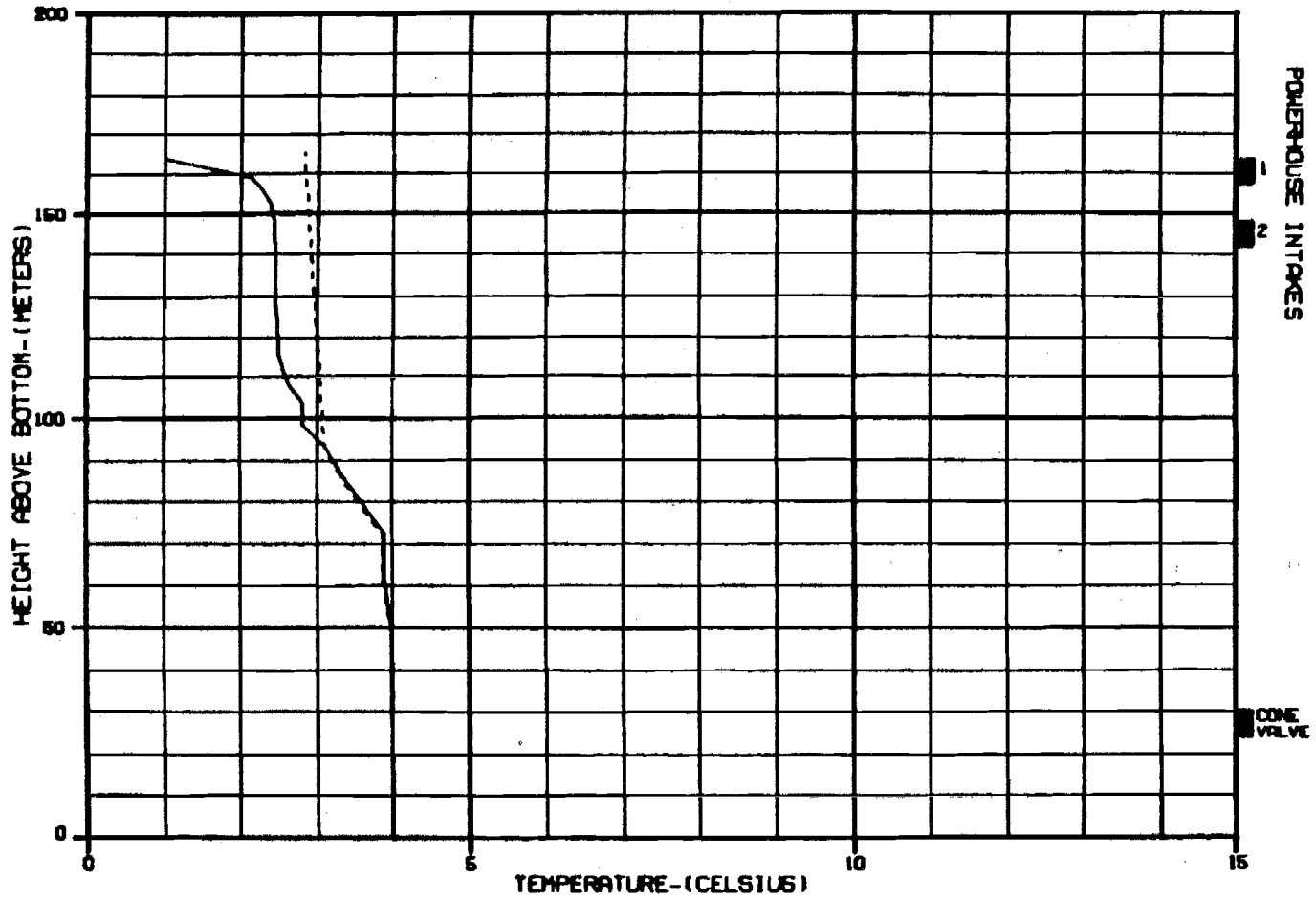
ALASKA POWER AUTHORITY

SUBMITTA PROJECT | DYNEM MEBL

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-ENBSCO JOINT VENTURE

DESIGN: B.L.P. 8 JAN 84 42-010-04



CASE: ■■ DC7420A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

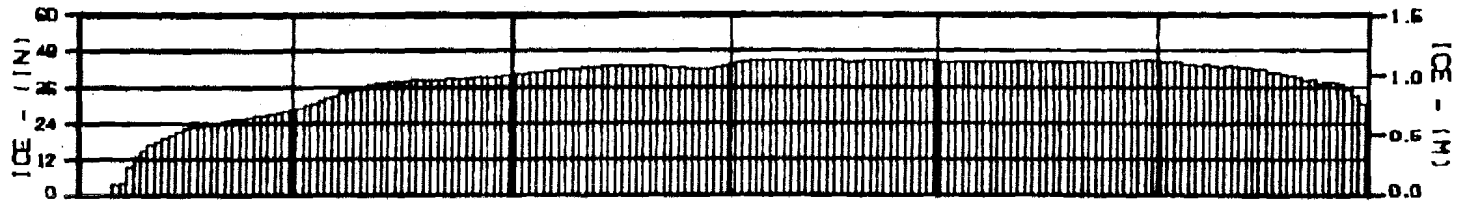
LEGEND:

PREDICTED TEMPERATURE PROFILES:

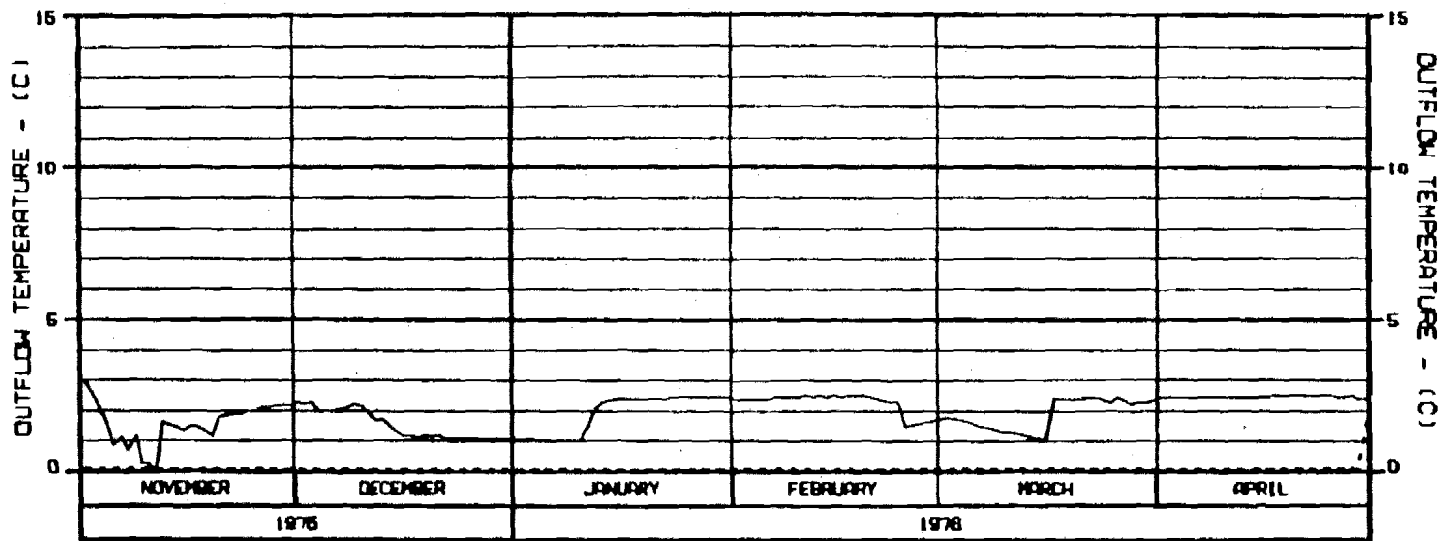
- | MAY 1975
- - - | JUNE 1975
- · - · | JULY 1975

ALASKA POWER AUTHORITY		
DESIGN PROJECT	DESIGN MODEL	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
DESIGN NUMBER	DATE	REV
01-000	0 JAN 84	4E-010-04

EXHIBIT AQ



INTAKE	LEVEL 1				
	LEVEL 2				
	CONE VALVE				
	SPILLWAY				

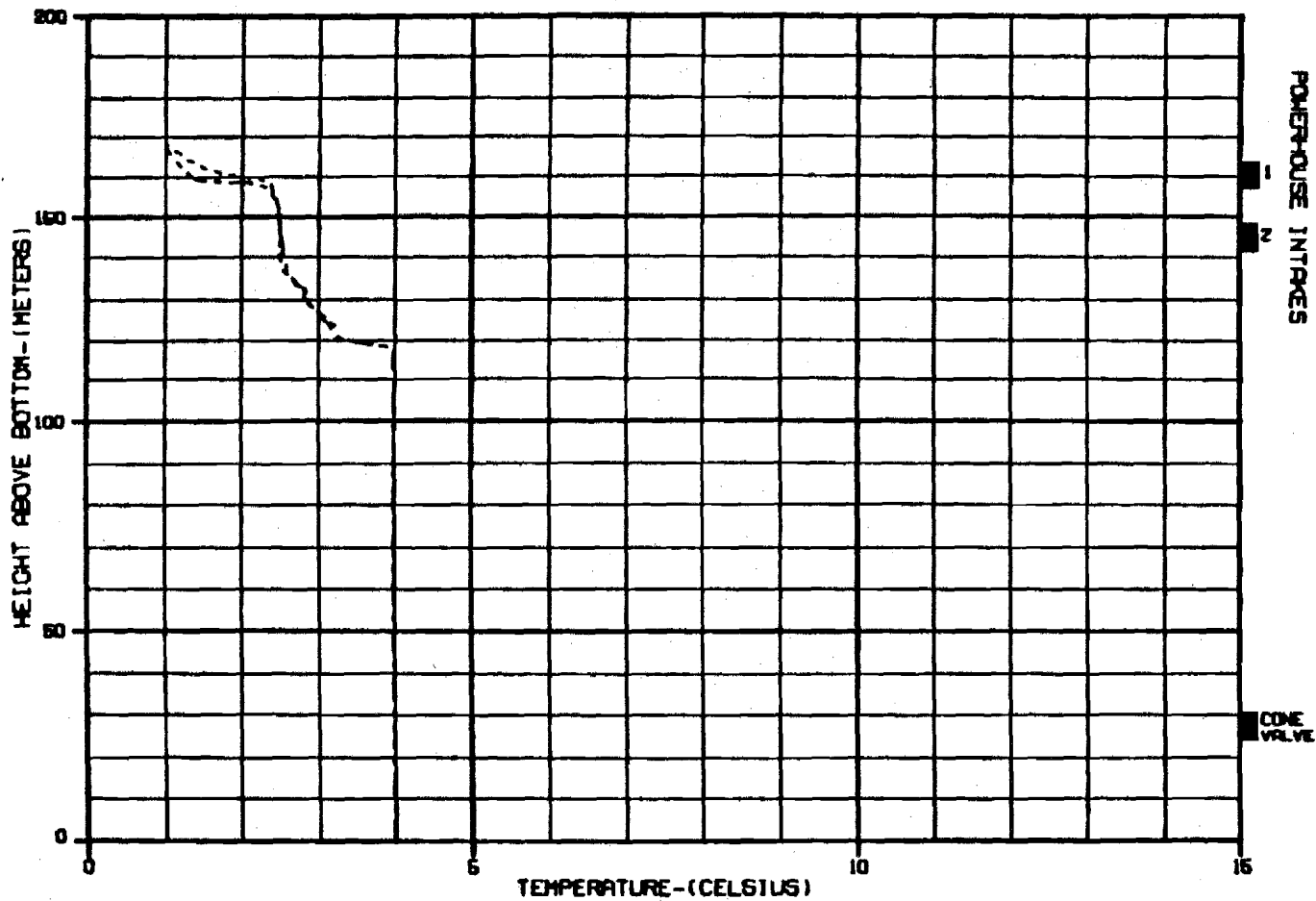


LEGEND: CASE: ■ DC7620A - DEVIL CANYON OPERATION WITH NATANA IN 2020 ■

— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO NATANA RESERVOIR

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 1425 FT (434.34 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1276 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

ALASKA POWER AUTHORITY	
OWNER PROJECT	OPERATION
DEVIL CANYON RESERVOIR	
OUTFLOW TEMPERATURE	
AND ICE GROWTH	
HARZA-EBRACO JOINT VENTURE	
DESIGNED: D.L. BROWN	3 JAN 81
DRAWN: L.W. 48-048-04	



CASE: ■■ DC7820A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

_____ | NOVEMBER 1976
 - - - - - | DECEMBER 1976
 - · - · - | JANUARY 1976

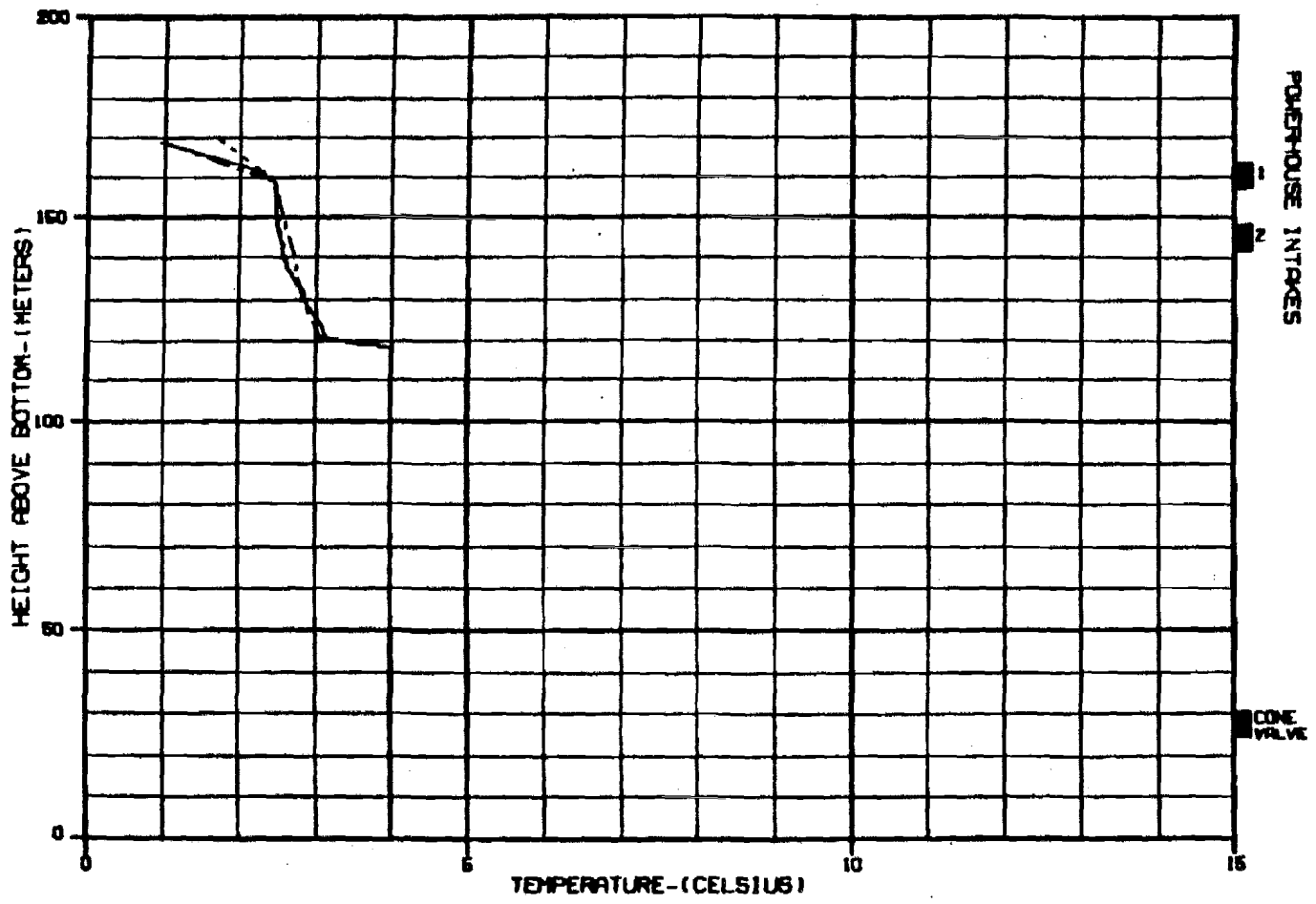
ALASKA POWER AUTHORITY

RESERVOIR PROJECT DIVISION HEAD

DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

WARZA-EBASCO JOINT VENTURE

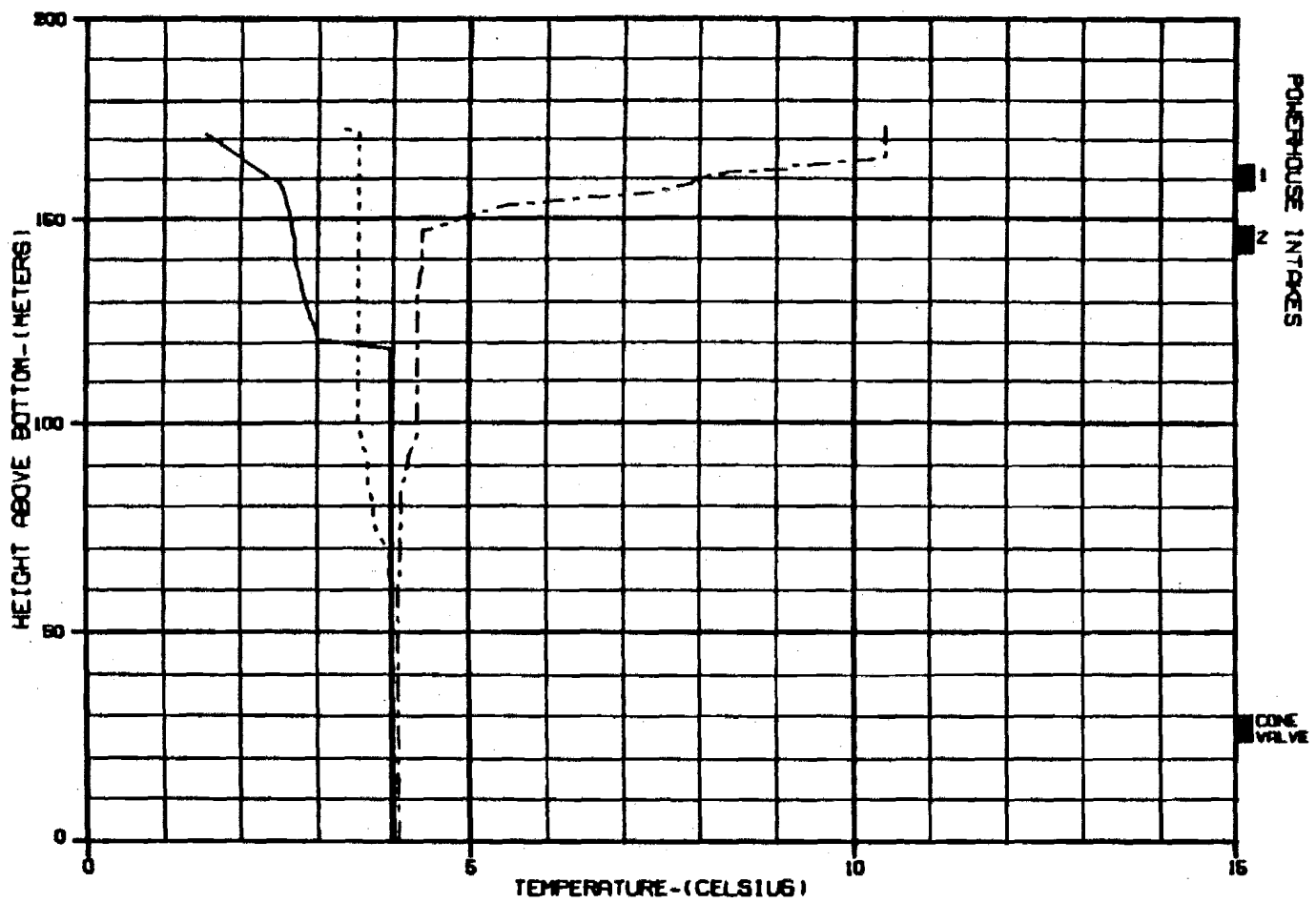
REVISED: 11/20/76 8 JAN 81 42-018-04



CASE: DC7820A - DEVIL CANYON OPERATION WITH MATANA IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1976
 - - - - | MARCH 1976
 - · - · | APRIL 1976

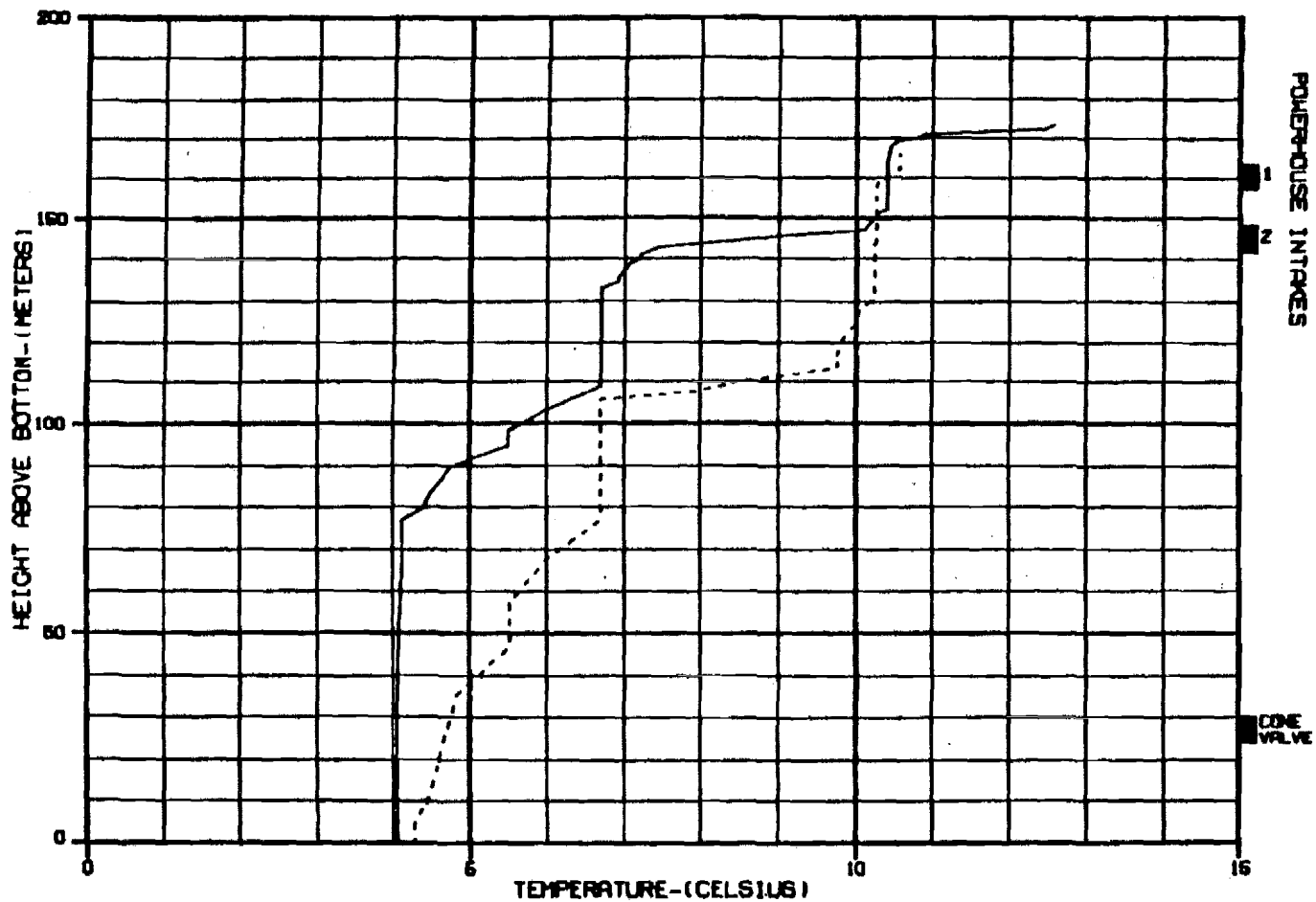
ALASKA POWER AUTHORITY		
OWNER PROJECT	OWNER MODEL	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
DESIGN: SLD/DR	DATE: JAN 84	42-018-04



CASE: ■■ DC7620A - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ——— 1 MAY 1976
 - - - - 1 JUNE 1976
 - · - · 1 JULY 1976

ALASKA POWER AUTHORITY		
DESIGN PROJECT	DIVISION HEAD	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
WARZA-EBRACO JOINT VENTURE		
DATE: 11/1/76	BY: JAM/SL	42-010-04



CASE: ■■ DC7620A - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

——— | AUGUST 1976
 | SEPTEMBER 1976
 - - - - | OCTOBER 1976

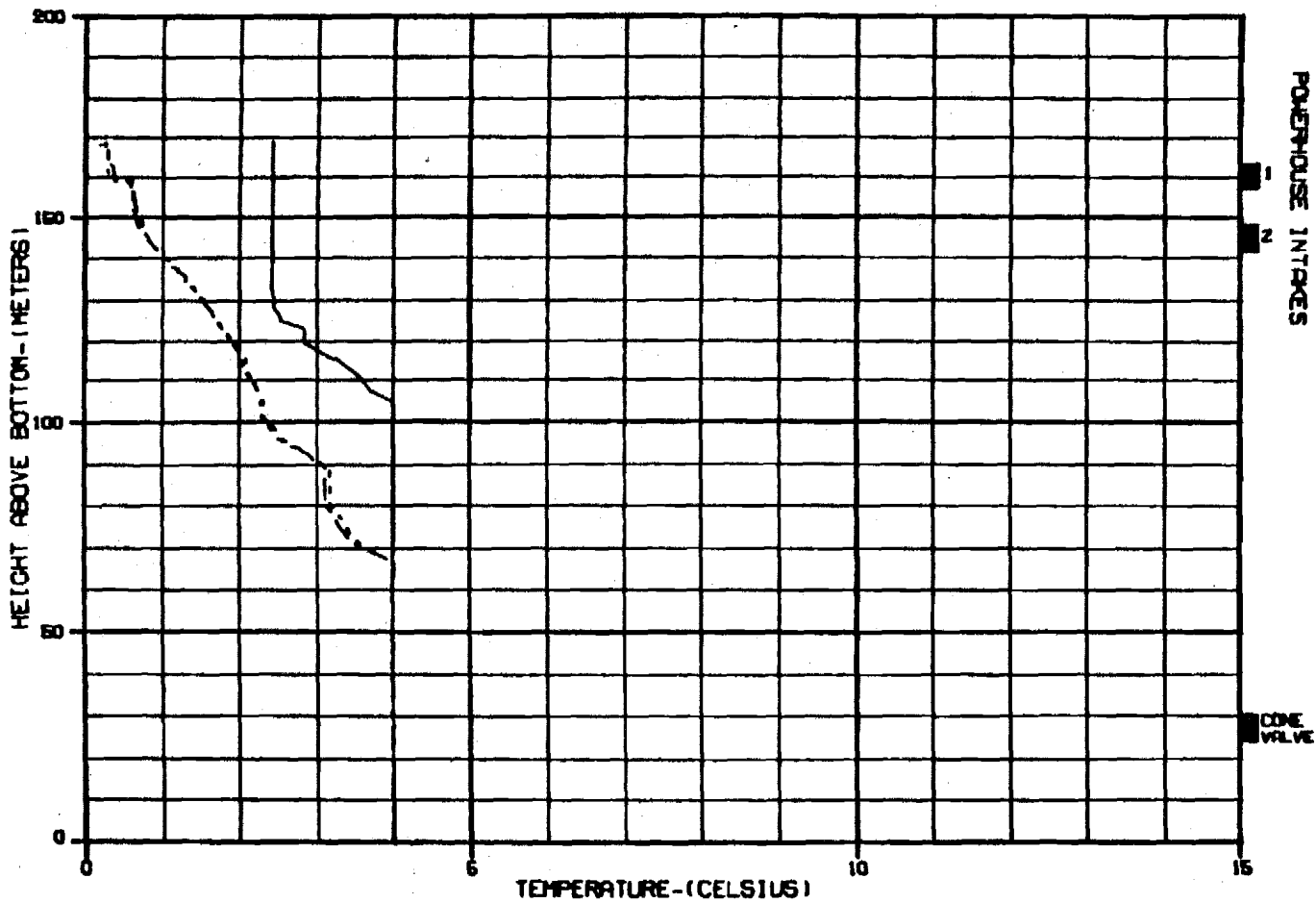
ALASKA POWER AUTHORITY

STATION PROJECT	OPERATION
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DEVIL CANYON RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRSCO JOINT VENTURE

OWNER: ALPWR	DATE: 8-10-76	4E-010-04
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CASE: DC7820A - DEVIL CANYON OPERATION WITH WATANA IN 2020

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 NOVEMBER 1976
 - - - 1 DECEMBER 1976
 . . . 1 JANUARY 1977

ALASKA POWER AUTHORITY

WATANA PROJECT

WATANA MODEL

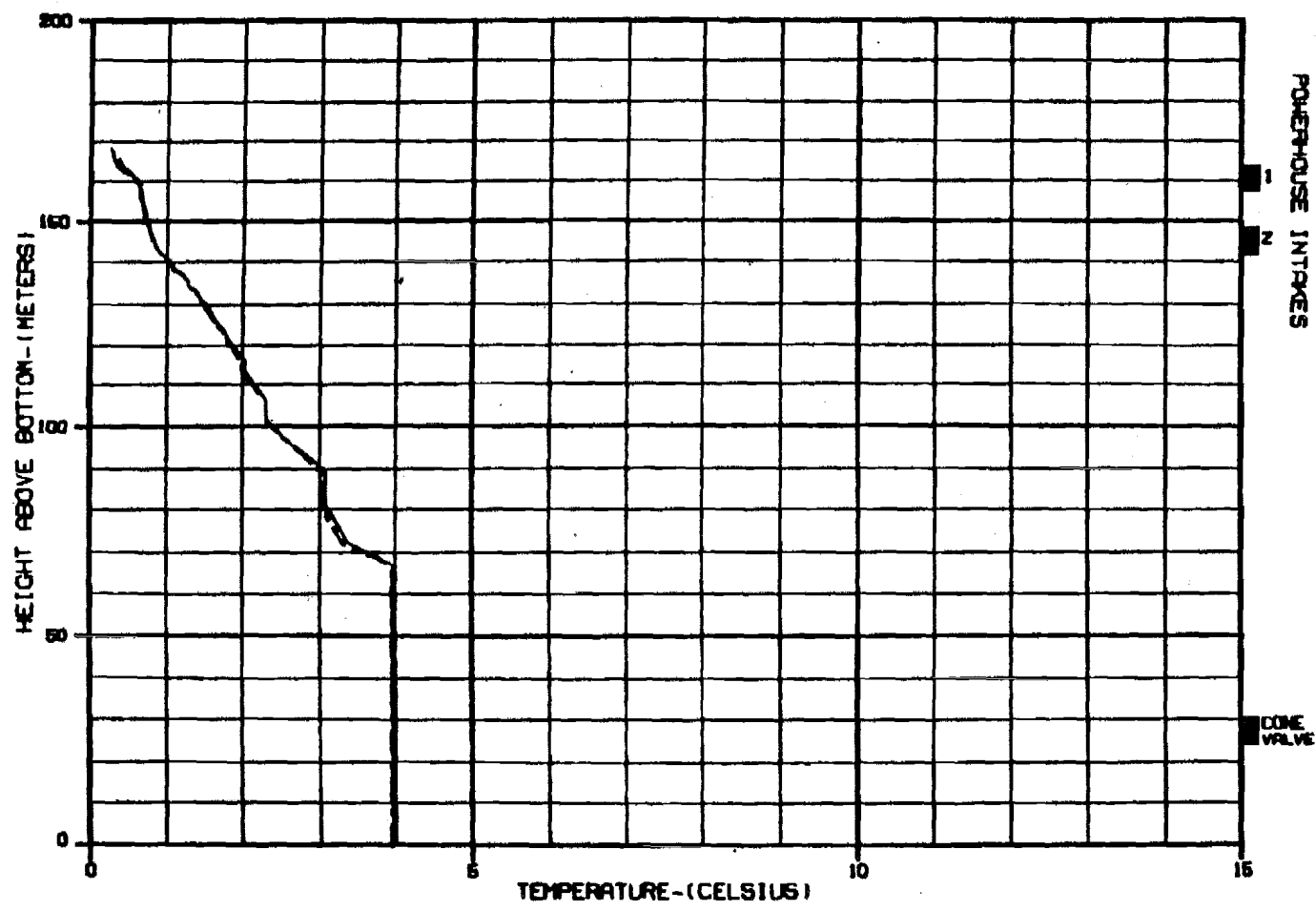
DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DATE: 11/20/76

BY: JAM

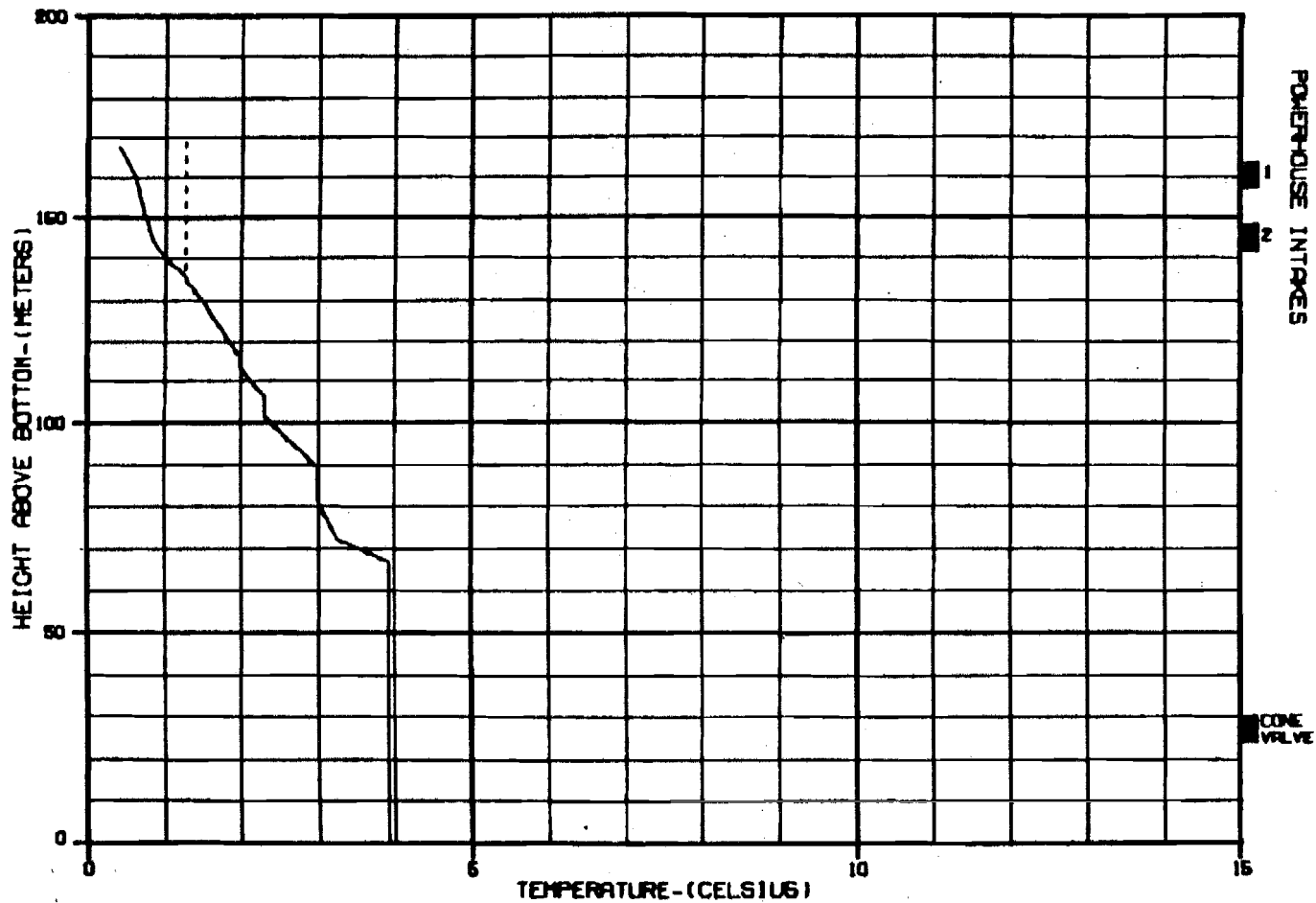
42-010-04



CASE: DC7820A - DEVIL CANYON OPERATION WITH MATANA IN 2020

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1977
 - - - - | MARCH 1977
 - · - · | APRIL 1977

ALASKA POWER AUTHORITY		
SUBMITTAL PROJECT	DIVISION HEAD	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
DESIGNED BY	DATE	PROJECT NO.
LLP/MS	1 JAN 81	47-010-04



CASE: MW DC7620A - DEVIL CANYON OPERATION WITH WATANA IN 2020 MW

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— MAY 1977
 - - - JUNE 1977
 . . . JULY 1977

ALASKA POWER AUTHORITY

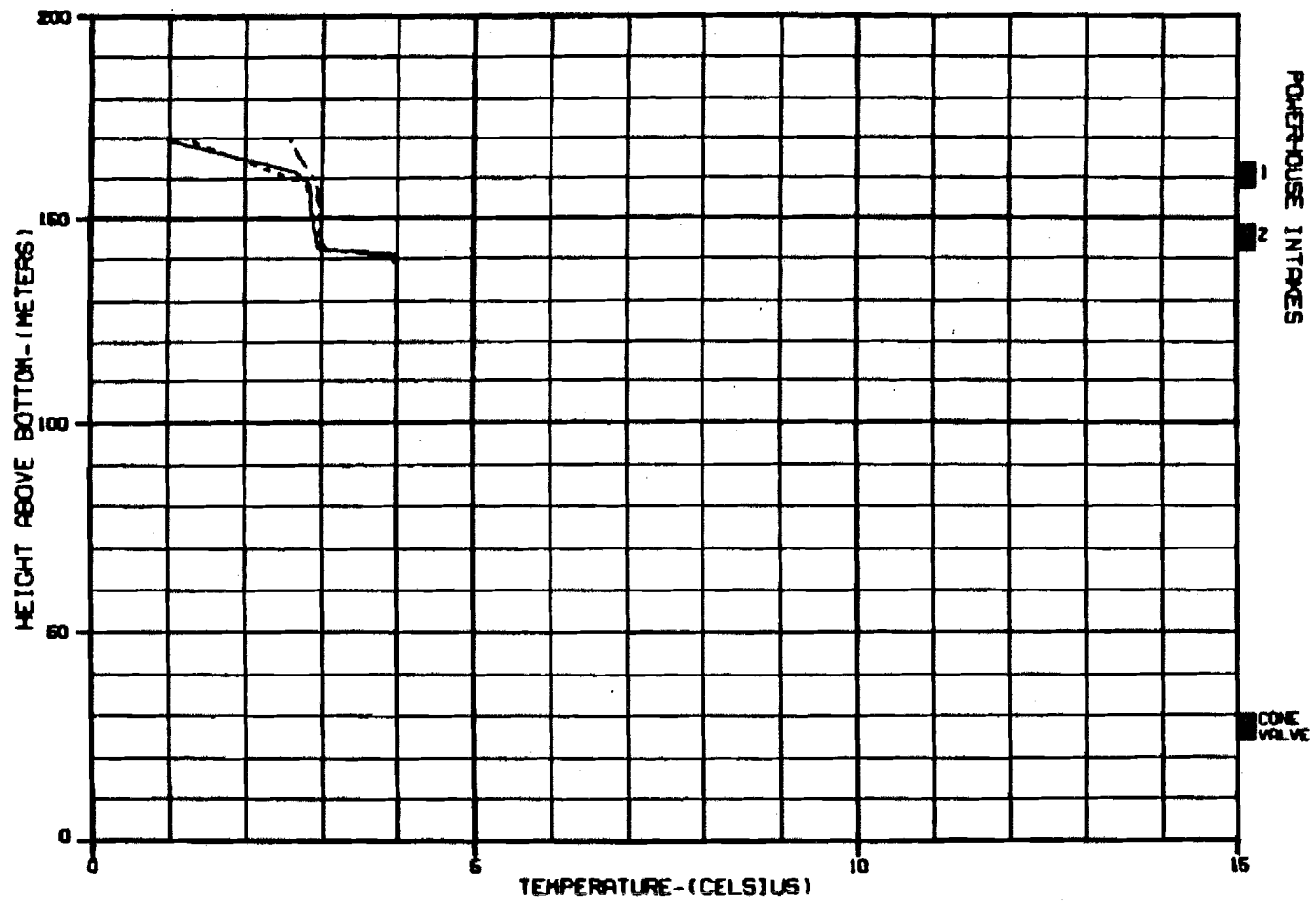
DEVELOPER PROJECT | DESIGN MODEL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HAZRA-EBASCO JOINT VENTURE

DESIGN: ALASKA | 0 JAN 81 | 42-010-04

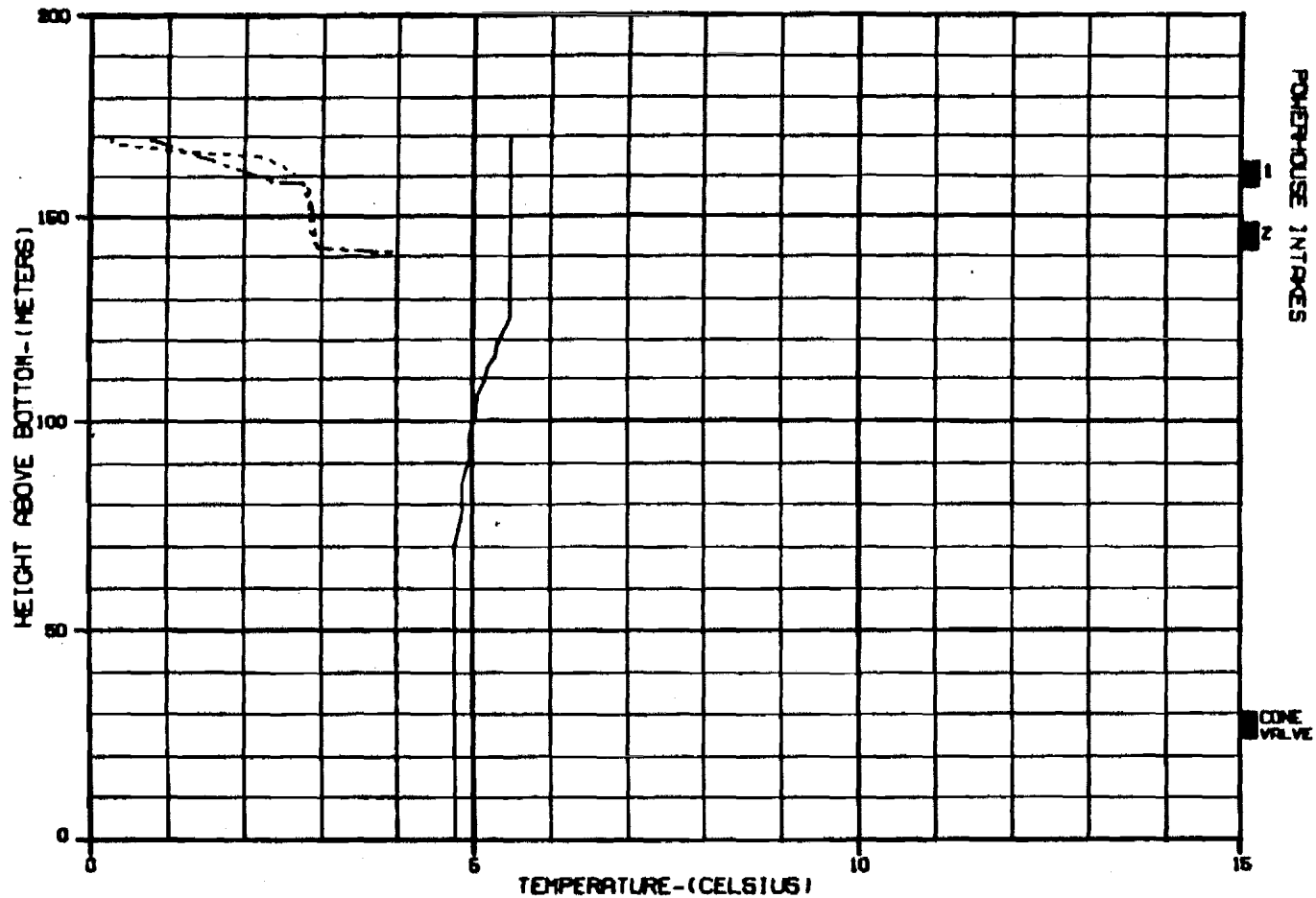
EXHIBIT AR



CASE: ■■ DC811821208 - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1982
 - - - - - | MARCH 1982
 ········ | APRIL 1982

ALASKA POWER AUTHORITY	
OWNER PROJECT	DESIGN MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
HARZA-EBRSCO JOINT VENTURE	
DESIGNED: 01/10/82	0.00 01 42-010-04



CASE: ■ DC811821208 - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1981
 | DECEMBER 1981
 - - - - | JANUARY 1982

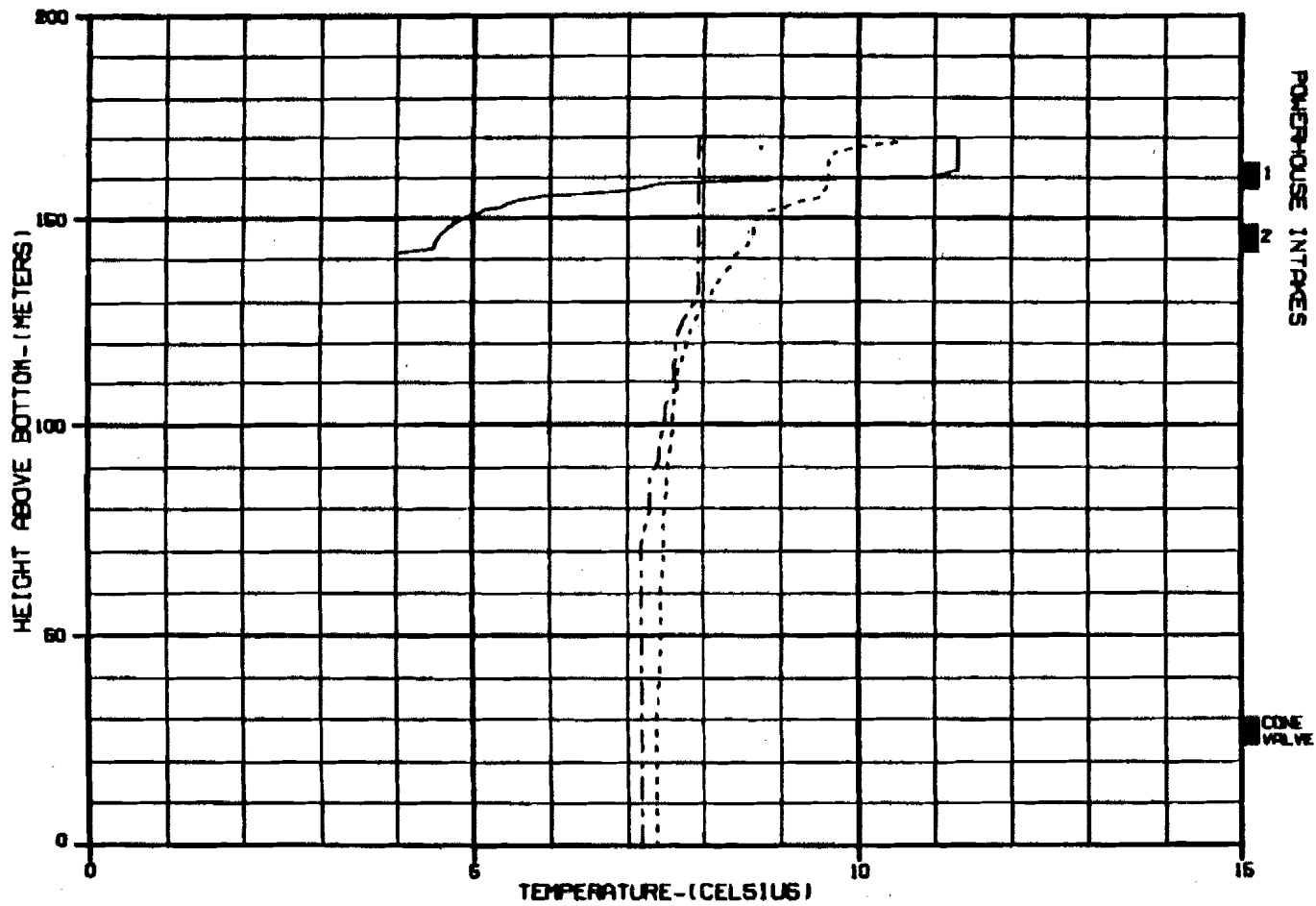
ALASKA POWER AUTHORITY

DEVELOPER PROJECT OPERATOR

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBRARD JOINT VENTURE

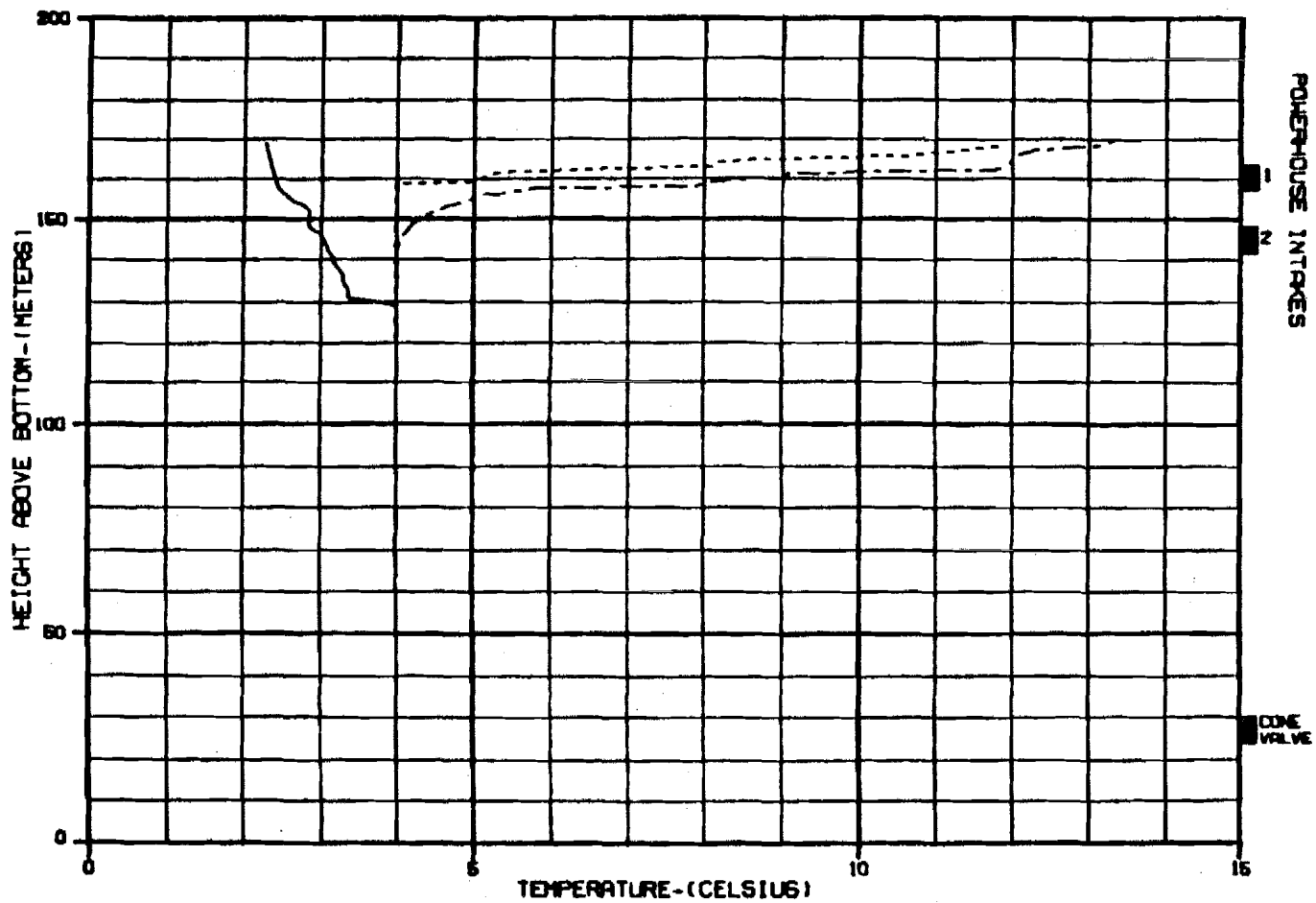
DESIGNED BY: [] DATE: 0 JAN 81 42-010-04



CASE: ■■ DCB11821208 - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■
 - WATANA WEATHER STATION DATA

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ———— | AUGUST 1981
 | SEPTEMBER 1981
 - - - - | OCTOBER 1981

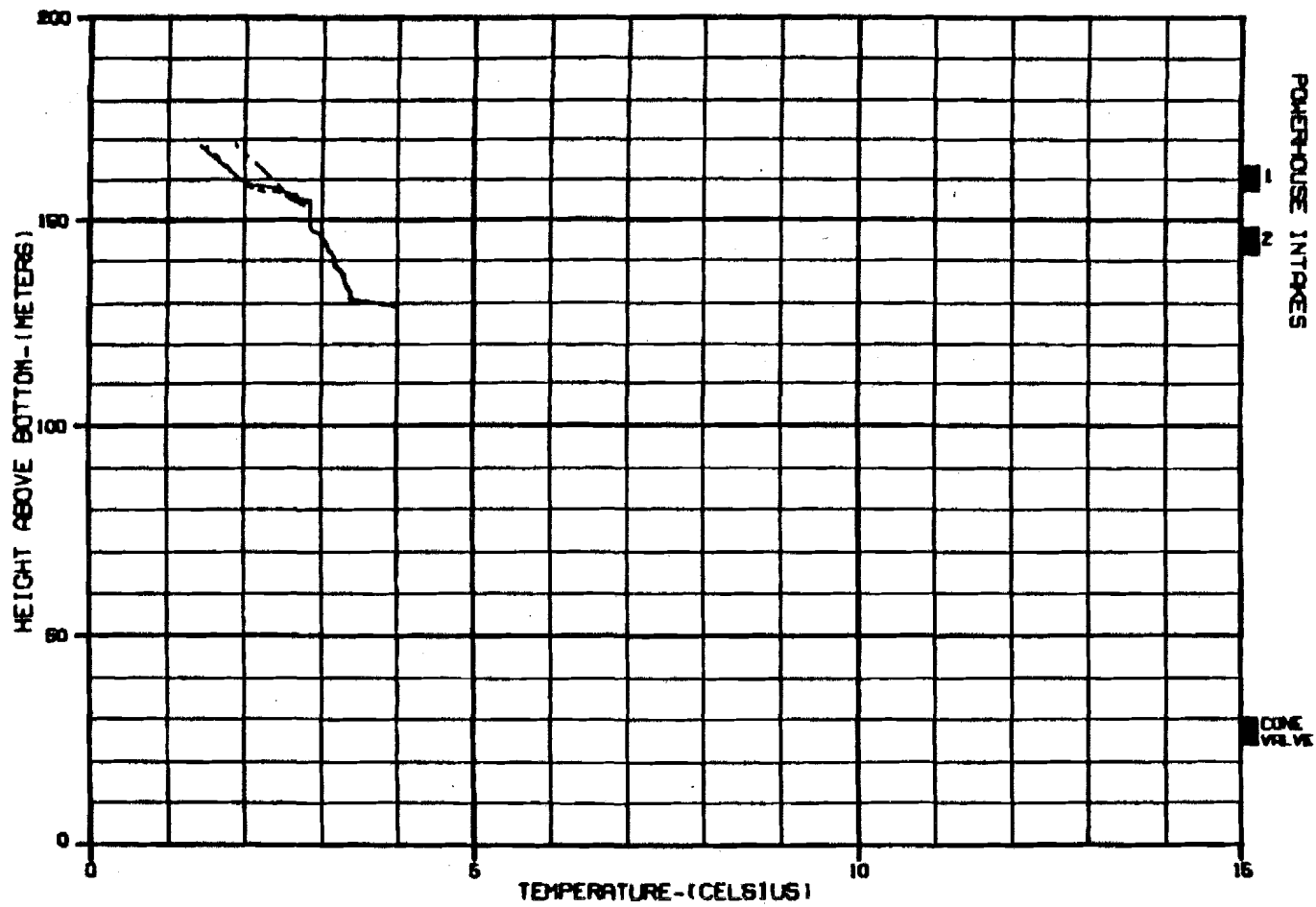
ALASKA POWER AUTHORITY		
OWNER PROJECT	DASHEN HEAD	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
OWNER: ALPWA	DATE: 8 JAN 81	42-010-04



CASE: ## DC811821208 - DEVIL CANYON OPERATION WITH WATANA IN 2020 ##
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 _____ | MAY 1981
 - - - - - | JUNE 1981
 - . - . - | JULY 1981

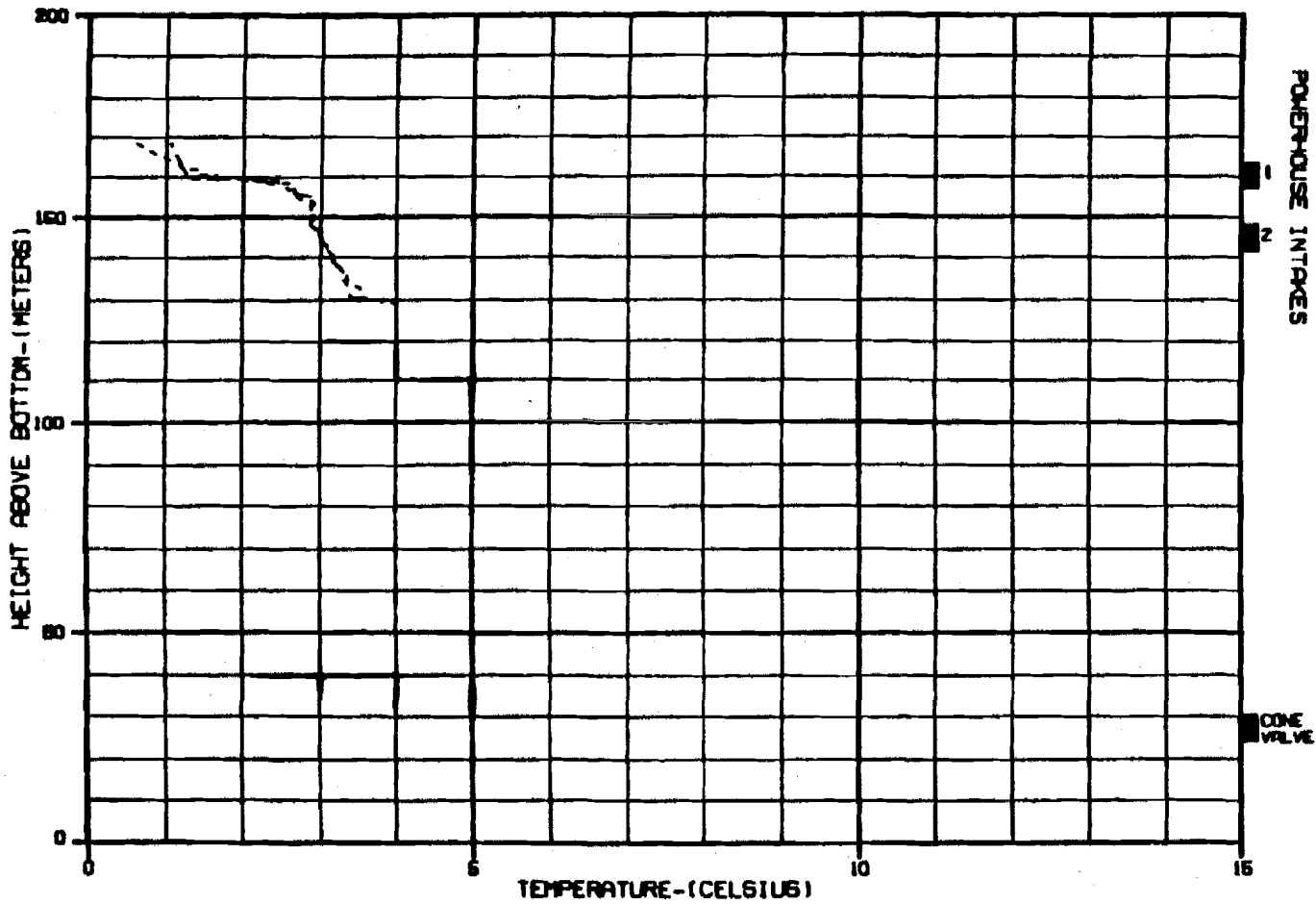
ALASKA POWER AUTHORITY		
SUBMITTER PROJECT	DEVIL CANYON RESERVOIR	
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES		
HARZA-EBASCO JOINT VENTURE		
ISSUED - 11/10/81	BY JAR/SH	42-010-04



CASE: ■■ DC811B2120B - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1981
 | MARCH 1981
 - - - - | APRIL 1981

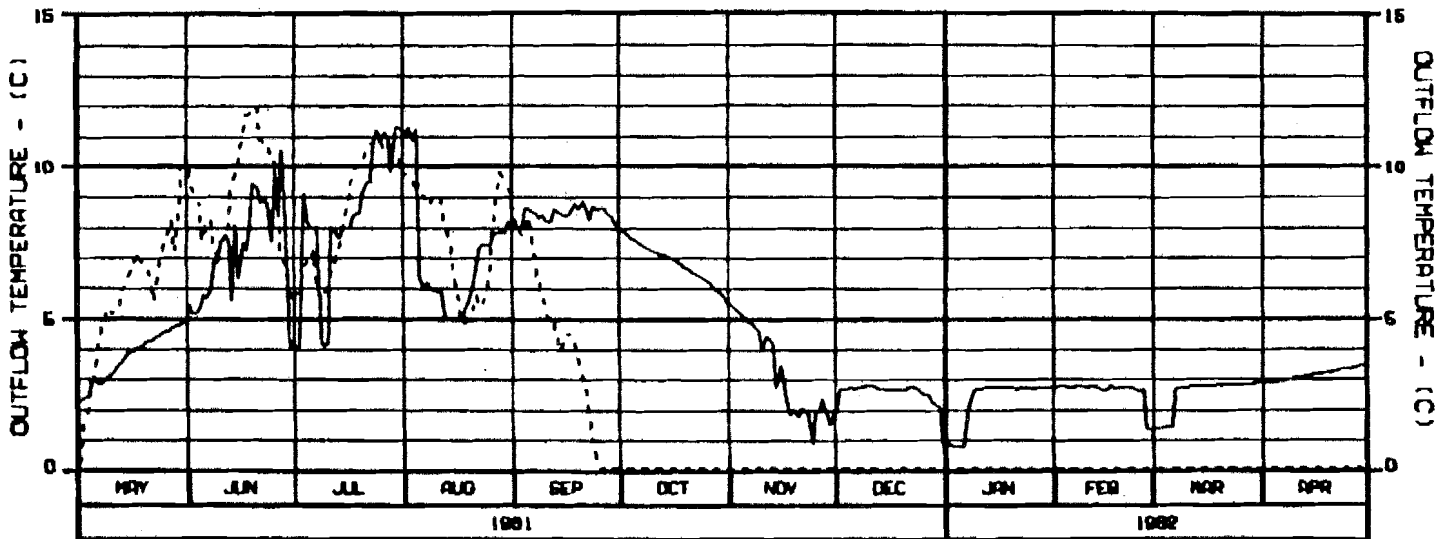
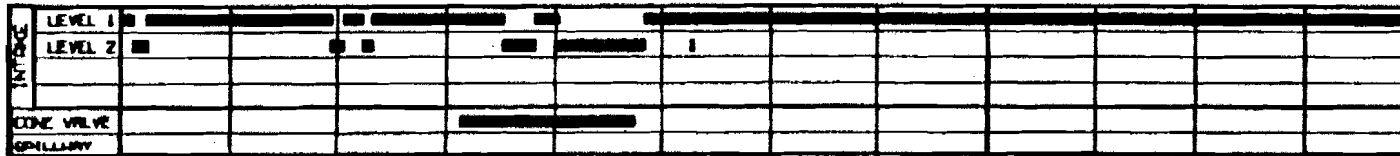
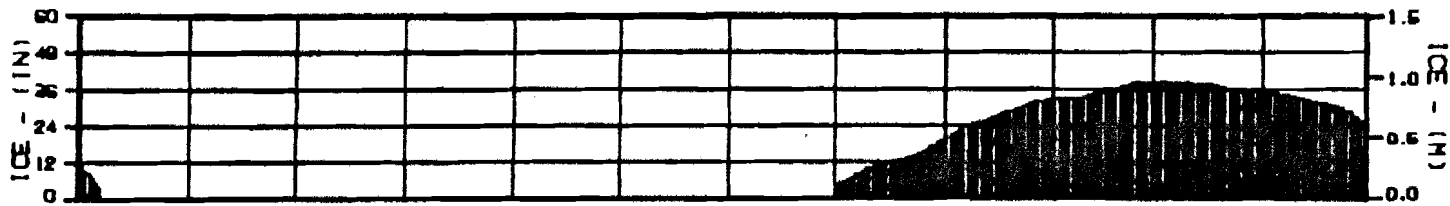
ALASKA POWER AUTHORITY	
SUBJECT PROJECT	OPERATION MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
HAZA-EBASCO JOINT VENTURE	
ISSUED: 11/28/81	4-010-04



CASE: DCB1182120B - DEVIL CANYON OPERATION WITH WATANA IN 2020
 - WATANA WEATHER STATION DATA

LEGEND:
 PREDICTED TEMPERATURE PROFILES:
 ———— | NOVEMBER 1980
 | DECEMBER 1980
 - - - - | JANUARY 1981

ALASKA POWER AUTHORITY		
SUBMITTER PROJECT	OPERATION MODEL	
DEVIL CANYON RESERVOIR		
TEMPERATURE PROFILES		
HARZA-EBRSCO JOINT VENTURE		
DESIGNER: ALASKA	DATE: 8 JAN 81	REV: 010-04



LEGEND: CASE: ■ DC811821208 - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■
 - MATANA WEATHER STATION DATA
 ——— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTE: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.84 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1276 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 980 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

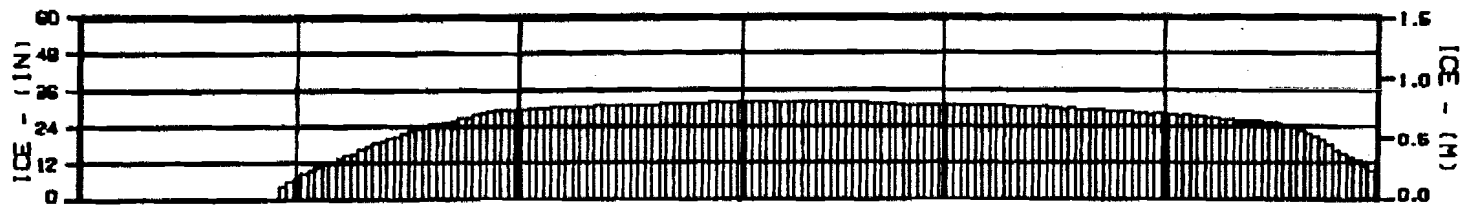
ALASKA POWER AUTHORITY

DEVIL CANYON PROJECT OPERATIONAL MODEL

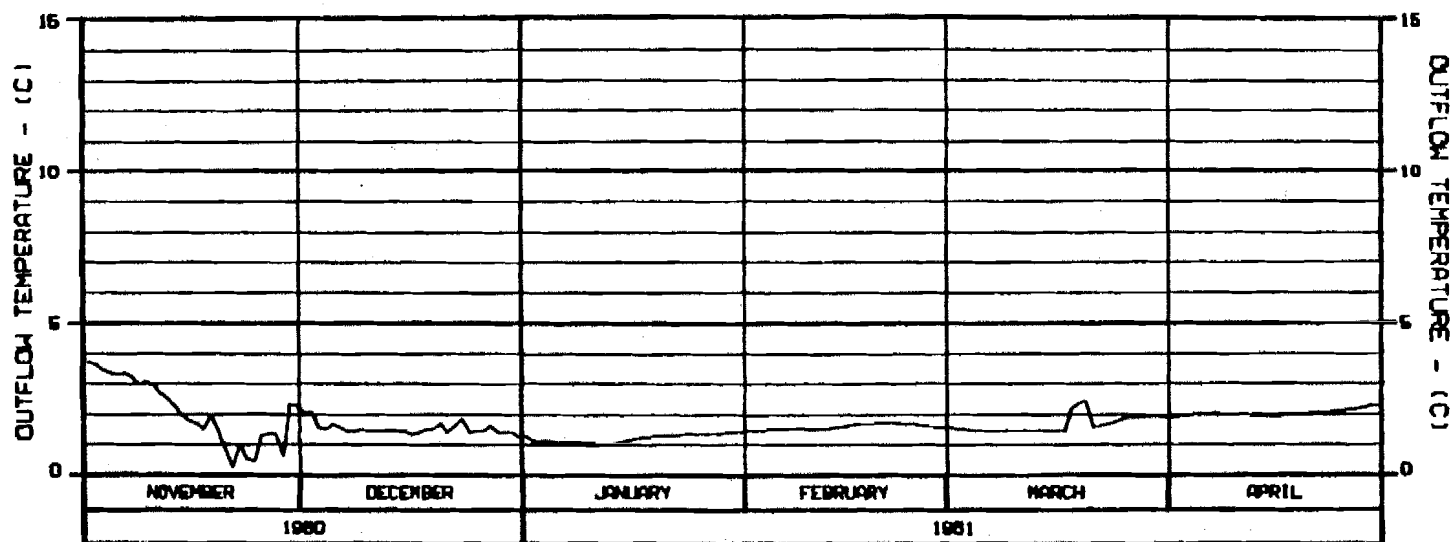
DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

REVISED: 11-1-88 8 JUN 89 1000.147.45-2000-20



INTAKE	LEVEL 1					
	LEVEL 2					
CONE VALVE						
SPILLWAY						



LEGEND: CASE: ■ DC81(82)208 - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■

———— PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1425 FT (434.24 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1375 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

ALASKA POWER AUTHORITY

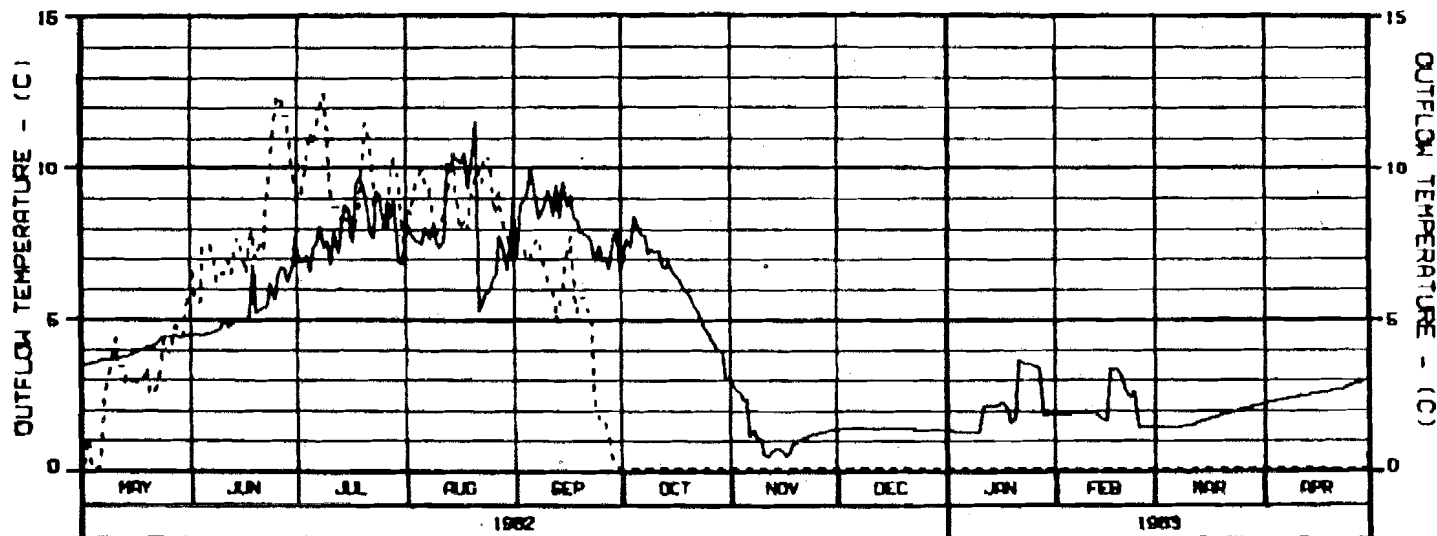
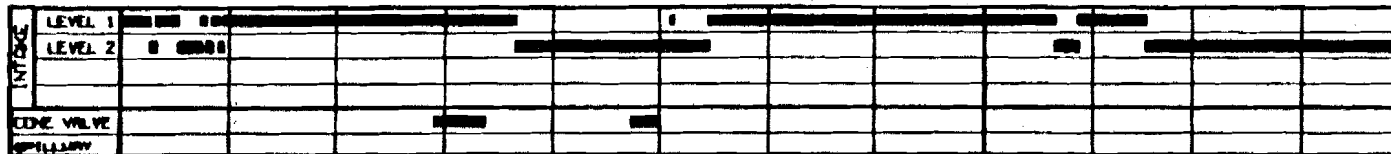
SUBMITTA PROJECT DESIGN NO. 00

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EBASCO JOINT VENTURE

DESIGNER: S.L. PARKS DATE: JAN 81 DRAWING NO.: 88-100-04

EXHIBIT AS



LEGEND: CASE: ■ DCB11021208 - DEVIL CANYON OPERATION WITH MATANA IN 2020 ■
 - MATANA WEATHER STATION DATA
 — PREDICTED OUTFLOW TEMPERATURE FROM DEVIL CANYON RESERVOIR
 - - - INFLOW TEMPERATURE TO MATANA RESERVOIR

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1425 FT (434.34 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1275 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 980 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)

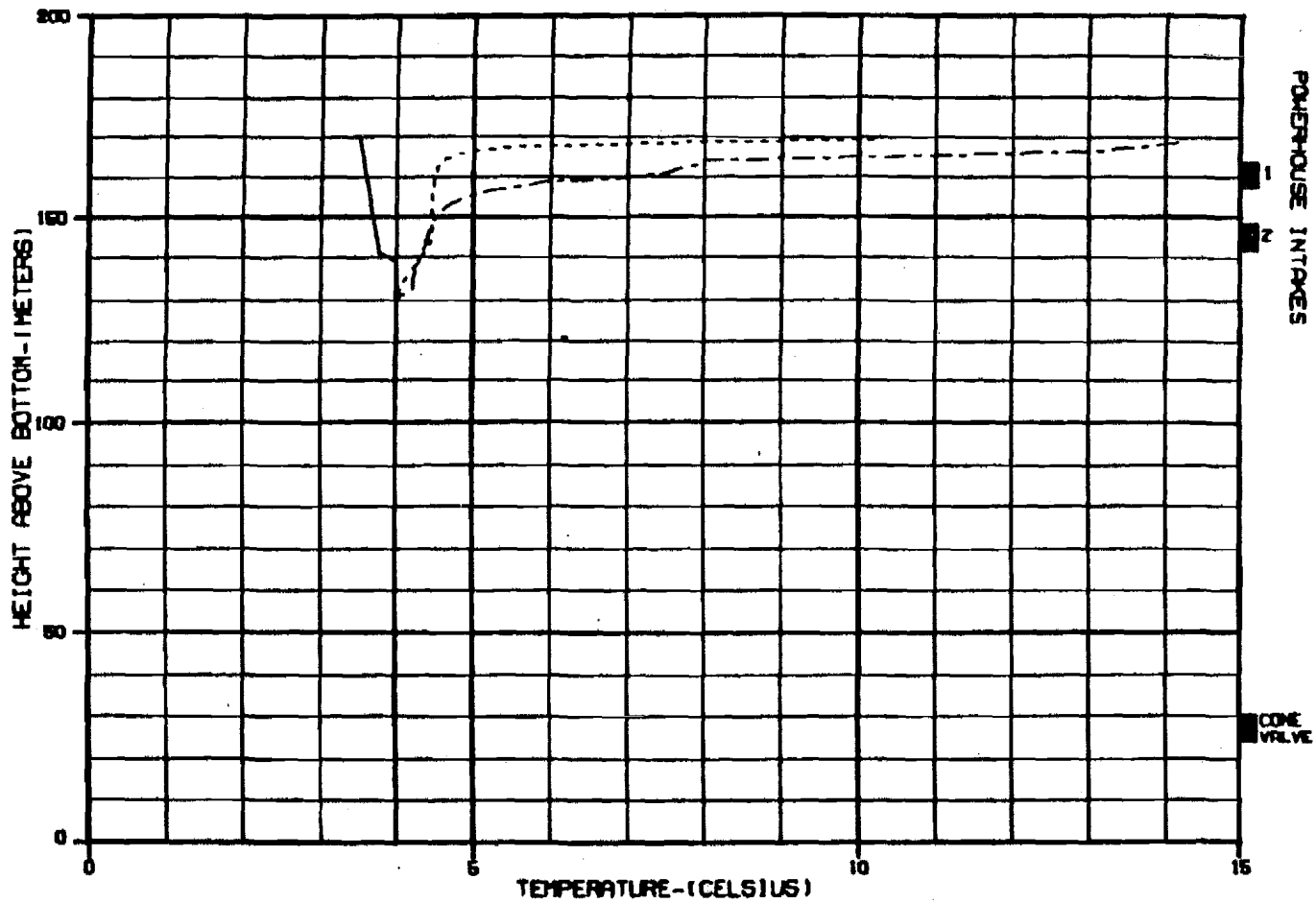
ALASKA POWER AUTHORITY

SUBMITTA PROJECT DESIGN MODEL

DEVIL CANYON RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH

HARZA-EGASCO JOINT VENTURE

DRAWN: S.L. BROWN 8 JAN 83 1000-140-00-00-04



CASE: ■■■ DCB(182)208 - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■■
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | MAY 1982
 - - - - - | JUNE 1982
 - · - · - | JULY 1982

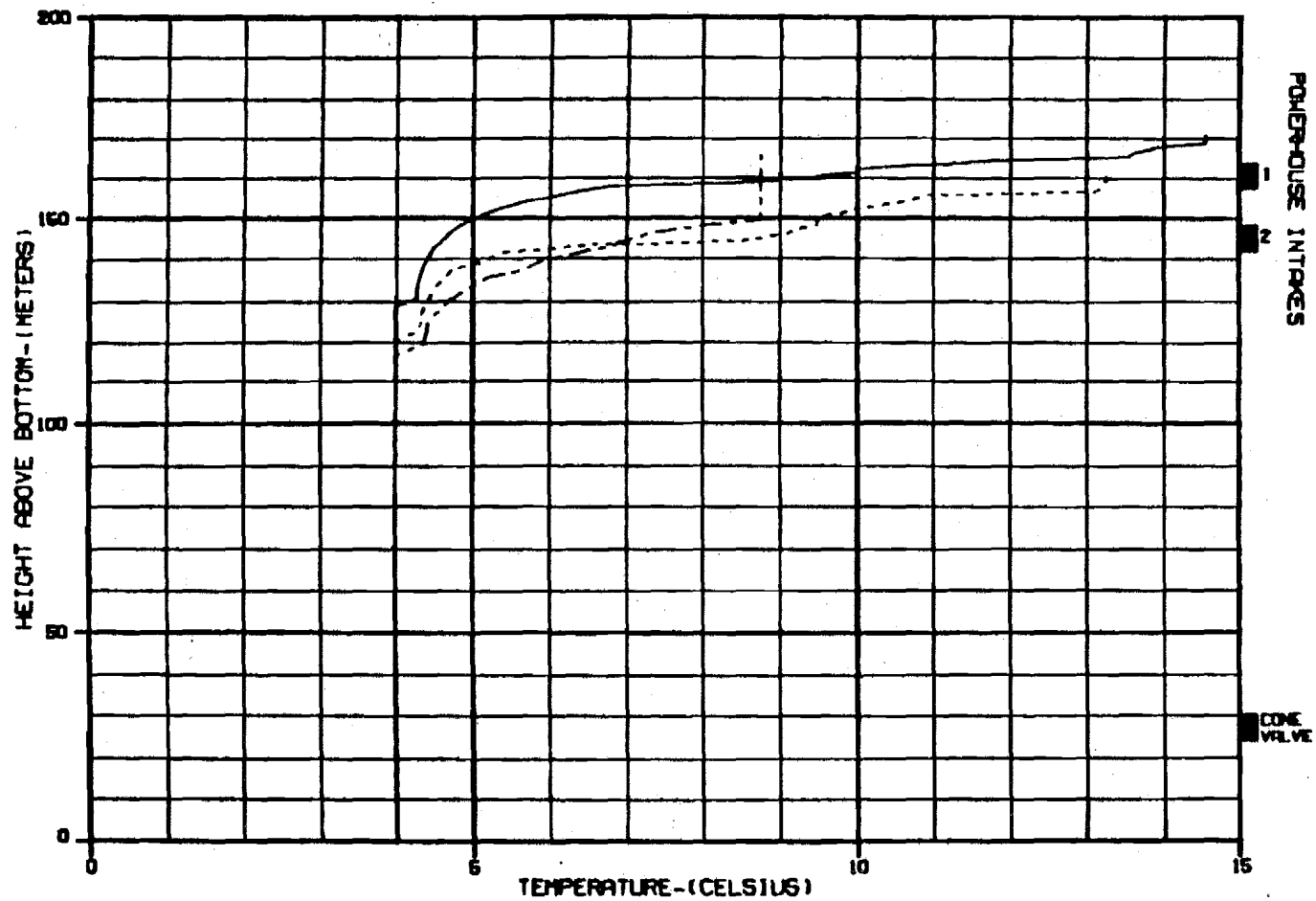
ALASKA POWER AUTHORITY

SUBMITTAL PROJECT | DESIGN MODEL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

WARZA-EBRSCO JOINT VENTURE

DESIGN: 01/20/82 | 0 JAN 82 | 42-010-04



CASE: ■■ DC811821208 - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | AUGUST 1982
 ···· | SEPTEMBER 1982
 - - - | OCTOBER 1982

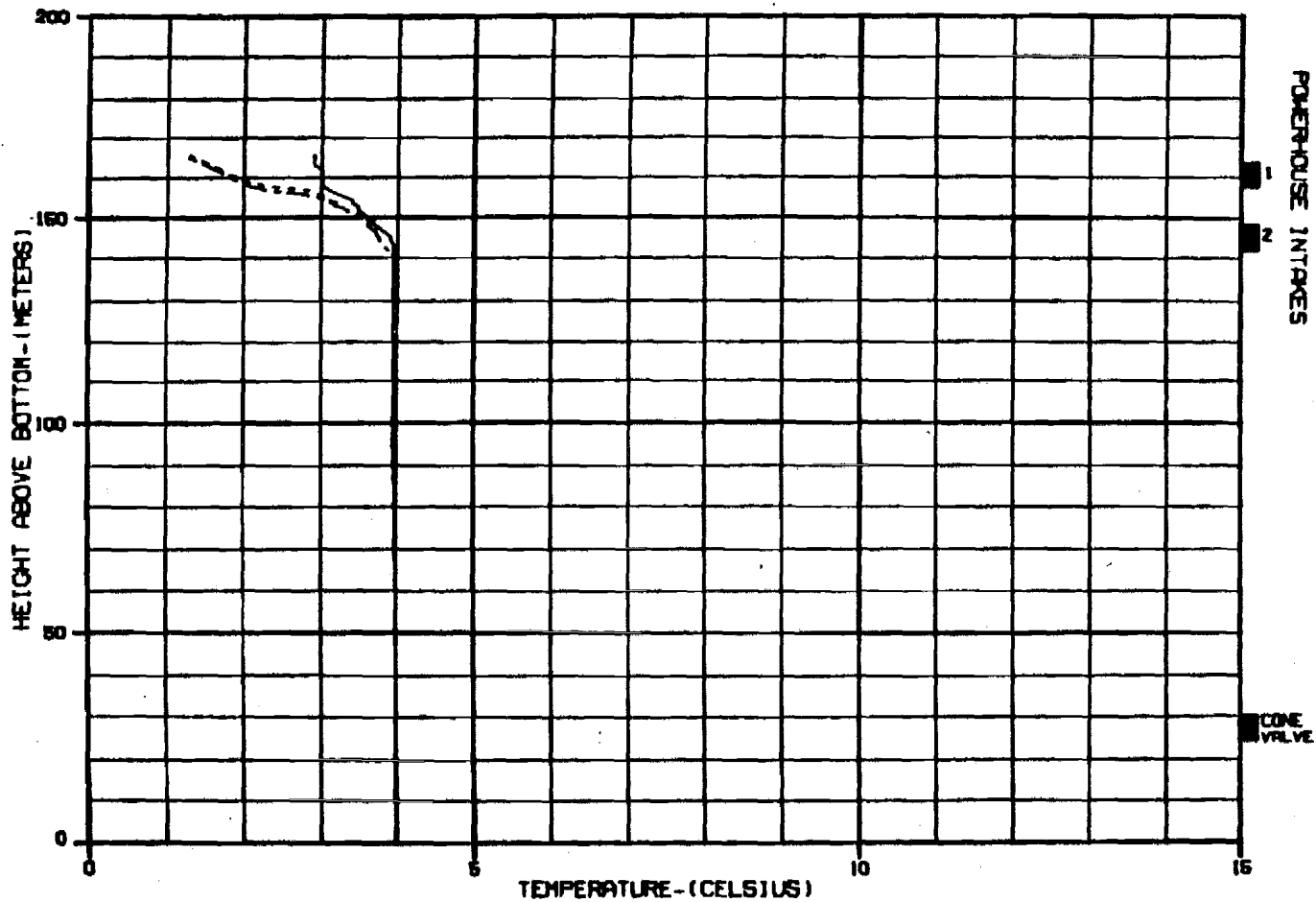
ALASKA POWER AUTHORITY

DEVELOPER PROJECT | OPERATOR PROJECT

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

WARDA-EBRARD JOINT VENTURE

DATE: 11/19/82 5:48 PM 42-810-04



CASE: ■■ DC911821208 - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■
 - WATANA WEATHER STATION DATA

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— | NOVEMBER 1982
 | DECEMBER 1982
 - - - - | JANUARY 1983

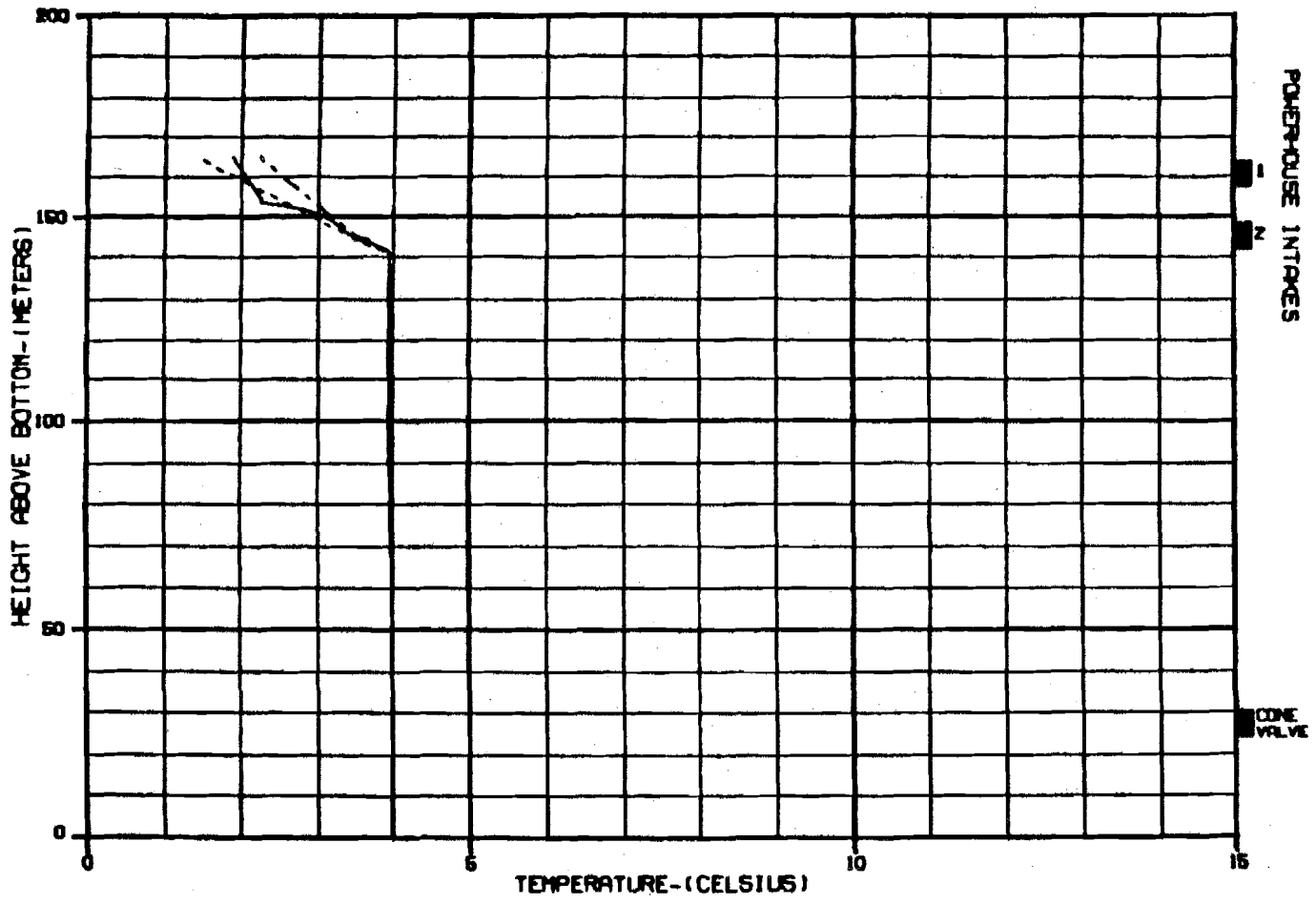
ALASKA POWER AUTHORITY

DISTRICT PROJECT DIVISION HEAD

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES

WARZA-EBR600 JOINT VENTURE

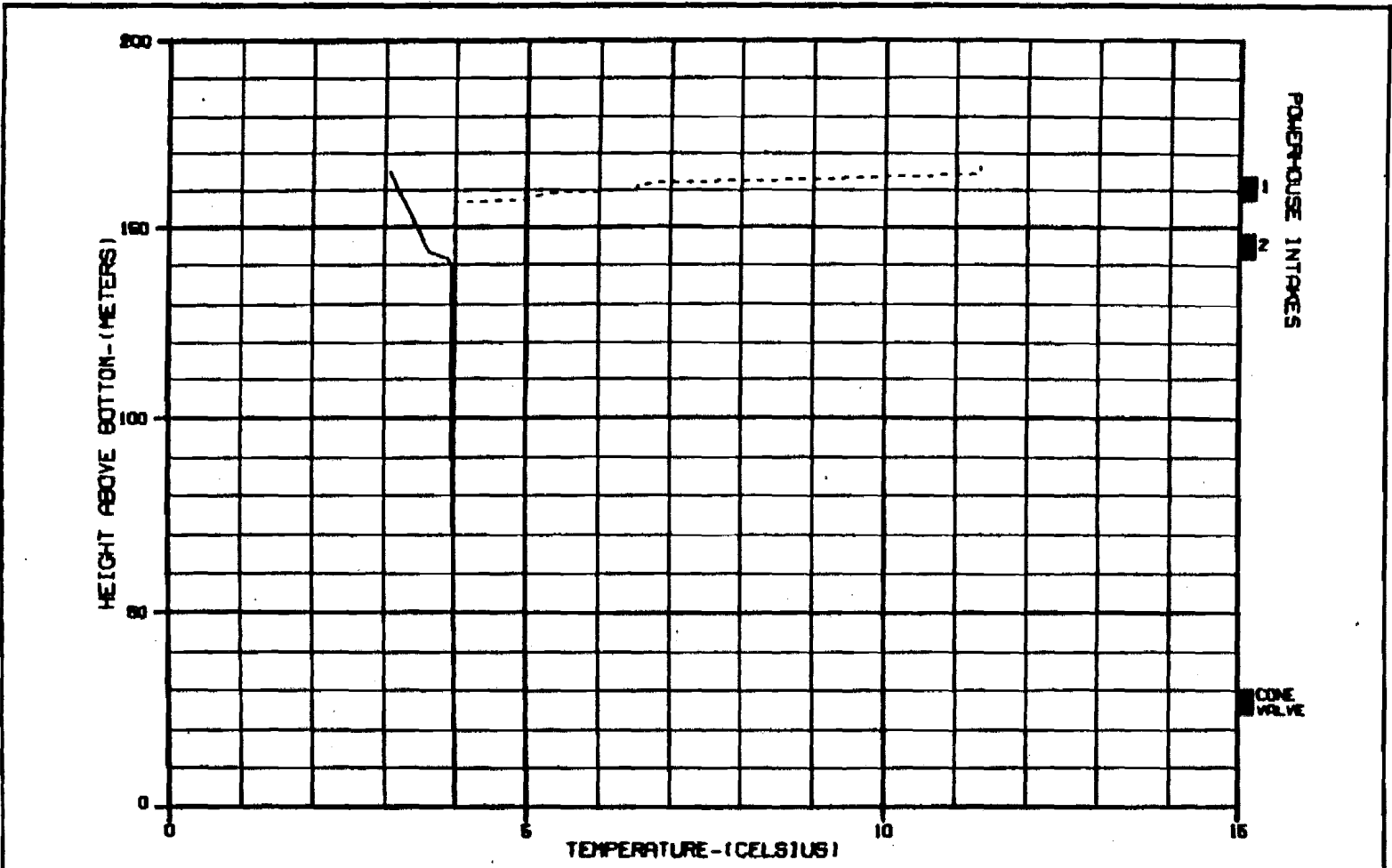
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CASE: DC811821208 - DEVIL CANYON OPERATION WITH MATANA IN 2020
 - MATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | FEBRUARY 1983
 | MARCH 1983
 - - - - | APRIL 1983

ALASKA POWER AUTHORITY		
DESIGN PROJECT	OPERATION NEEDS	
DEVIL CANYON RESERVOIR		
TEMPERATURE PROFILES		
WARSA-EBR603 JOINT VENTURE		
WORK NO. 811821208	DATE 01 JAN 84	REV 010-01



CASE: ■■ DCB1(B2)20B - DEVIL CANYON OPERATION WITH WATANA IN 2020 ■■
 - WATANA WEATHER STATION DATA

LEGEND: PREDICTED TEMPERATURE PROFILES:
 ———— | MAY 1983
 - - - - - | JUNE 1983

ALASKA POWER AUTHORITY	
DESIGN PROJECT	OPERATION MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES	
WARZA-EBR600 JOINT VENTURE	
DESIGNED BY	DATE
ILLUSTRATED BY	DATE
REVISION	DATE